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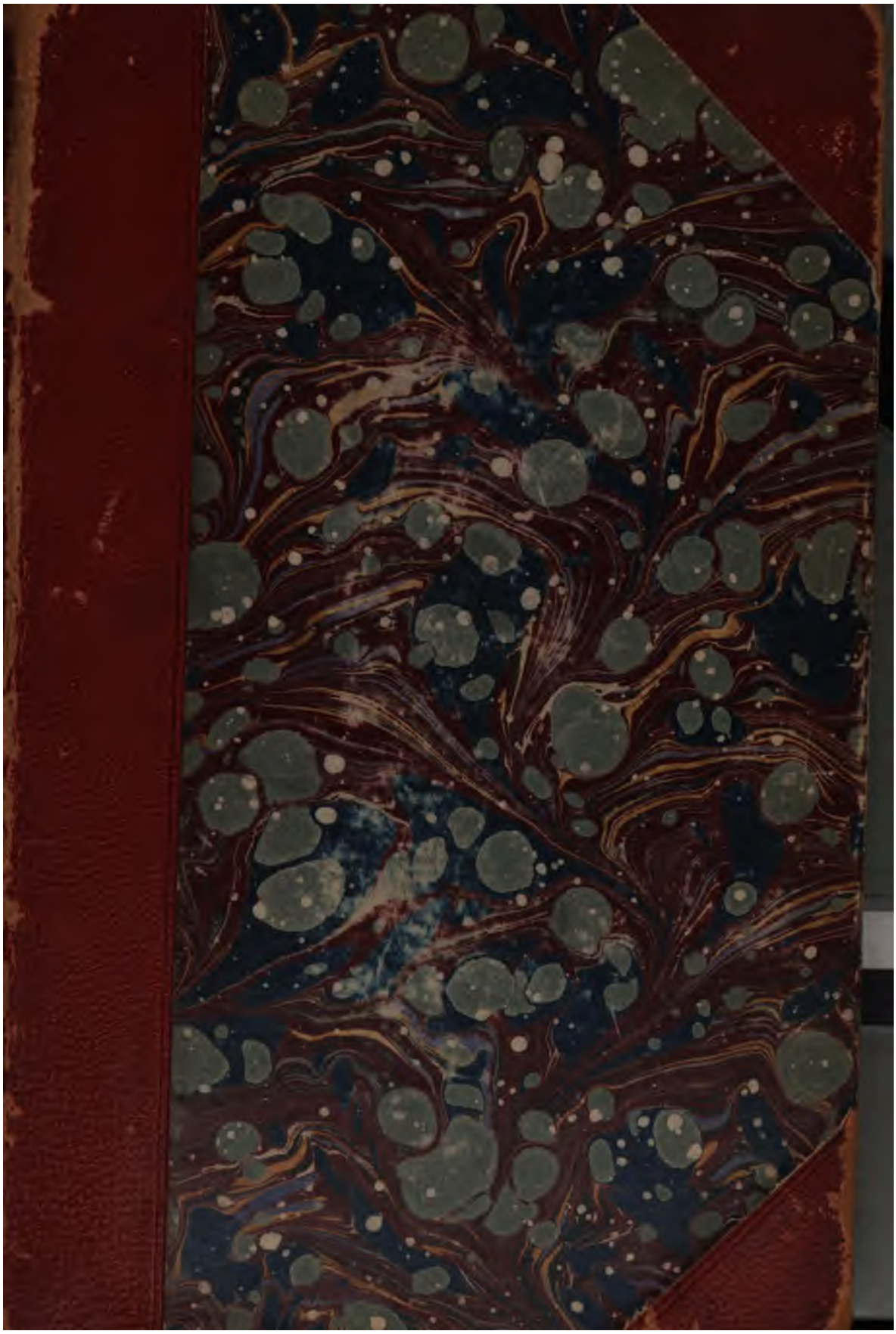

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No. XXV.

REPORTS OF EXPLORATIONS

IN THE

RRITORY OF ALASKA

(COOKS INLET, SUSHITNA, COPPER, AND TANANA RIVERS)

1898.

UNDER THE DIRECTION OF THE SECRETARY OF WAR,

BY

CAPTAIN EDWIN F. GLENN,
TWENTY-FIFTH UNITED STATES INFANTRY,
AND
CAPTAIN W. R. ABERCROMBIE,
SECOND UNITED STATES INFANTRY.

JULY, 1899.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1899.

WAR DEPARTMENT, - - ADJUTANT GENERAL'S OFFICE.

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REPORT

OF

CAPTAIN EDWIN F. GLENN,

TWENTY-FIFTH INFANTRY, U. S. A

REPORT OF CAPTAIN EDWIN F. GLENN

ON

EXPLORATIONS IN ALASKA.

WASHINGTON, D. C., *February 15, 1899.*

TO THE ASSISTANT SECRETARY OF WAR,
Washington, D. C.

[Through the Assistant Adjutant General, Department of the Columbia, Vancouver Barracks, Wash.]

SIR: I have the honor to submit herewith report of explorations made in Alaska under and by virtue of the following order and instructions:

GENERAL ORDERS, No. 8. HEADQUARTERS DEPARTMENT OF THE COLUMBIA, VANCOUVER BARRACKS, WASH., *March 16, 1898.*

Pursuant to telegraphic instructions from Headquarters of the Army, dated March 5, 1898, the following expeditions for exploring purposes in Alaska are announced:

I.—Expedition No. 1, consisting of Capt. Bogardus Eldridge, Fourteenth Infantry, commanding; Second Lieuts. Elmer W. Clark and Robert Field and 20 enlisted men, Fourteenth Infantry; Capt. D. L Brainard, commissary of subsistence, as quartermaster and commissary. First Lieut. Franklin M. Kemp, assistant surgeon; Acting Hospital Steward John G. Abele and two privates, Hospital Corps; guides to be employed as needed; fully equipped and supplied to June 30, 1898; about 384 reindeer, with proportional number of sledges and drivers, fully equipped and supplied to August 31, 1898, will proceed to Pyramid Harbor or Haines Mission, Alaska, not later than the 24th instant, and via the Dalton trail to Dawson, Northwest Territory, thence to vicinity of Belle Isle, Alaska, and there establish a military camp and depot.

The expedition will proceed thence to discover, explore, and mark a trail from the Yukon up Forty-Mile Creek to the Tanana River. It will also explore for other practicable routes southward from the Yukon between Belle Isle and Circle City to the Tanana. Its district of exploration will not be limited except by the valley of Forty-Mile Creek on the south, the Yukon on the east, and north to Circle City and the Tanana River on the west. It will also endeavor to communicate with Expeditions Nos. 2 and 3.

II.—Expedition No. 2, consisting of Capt. W. R. Abercrombie, Second Infantry, commanding; First Lieut. Guy H. Preston, Ninth Cavalry;

First Lieut. P. G. Lowe, Eighteenth Infantry; Second Lieut. R. M. Brookfield, Second Infantry; 15 enlisted men, Fourteenth Infantry; Acting Hospital Steward John W. Cleave and two privates, Hospital Corps; Alfred W. Gumaer and J. J. Rafferty, guides, and one geologist; fully equipped and supplied to June 30, 1898, and 50 reindeer, with proportional number of sledges and drivers, fully equipped and supplied to August 31, 1898, will proceed about the 1st proximo to Valdez Inlet, Alaska, there establish a camp and depot, and explore the valley of the Copper River and tributaries to the Tanana River, establishing a line of communication to the junction with Expedition No. 1, on the Tanana River. Its district of exploration will be the valley of Copper River and its tributaries and the country north to the Tanana River. It will also endeavor to communicate with Expeditions Nos. 1 and 3.

III.—Expedition No. 3, consisting of Capt. E. F. Glenn, Twenty-fifth Infantry, commanding; First Lieut. Henry G. Learnard and 19 enlisted men, Fourteenth Infantry; Second Lieut. J. C. Castner, Fourth Infantry; First Lieut. John S. Kulp, assistant surgeon; Acting Hospital Steward Arthur Neville and two privates, Hospital Corps; George H. Howe, guide and interpreter; Luther S. Kelly, clerk, and one geologist; fully equipped and supplied to June 30, 1898; 50 reindeer, with proportional number of sledges and drivers, fully equipped and supplied to August 31, 1898, will proceed to Port Wells, Prince William Sound, Alaska, about the 1st proximo, there establish a camp and depot, and explore northeastward for routes toward Copper and Sushitna rivers. This expedition will be ready to reembark about May 1, 1898, for Cooks Inlet, thence to explore northward and endeavor to discover the most direct and practicable route from tidewater to one or more crossings of the Tanana River in the direction of the Yukon, between Forty-Mile Creek and Circle City. It will also endeavor to communicate with Expeditions Nos. 1 and 2. Its district of exploration will be the route indicated and the country north between that and the Tanana and Yukon rivers. Passes through the Alaska Mountains south of the Tanana should be discovered if existing.

IV.—As much territory as possible will be covered by each expedition, especially between the Yukon, Tanana, Copper, and Sushitna rivers, and all information will be collected and embodied in the reports that may be valuable to the development of the country regarding topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military posts, mineral resources, timber, fuel, products, capability of sustaining stock or animals of any kind, and the animal best suited for service in that country in winter and summer. Maps and, when practicable, photographs will accompany all reports. Small parties should be detached from the main expeditions to explore the tributaries of streams and localities not covered by the main party.

V.—The commanding officer of each expedition is authorized to enlist not to exceed 50 Indians (natives of Alaska) for duty with his expedition, for periods of six months or less.

The Quartermaster's Department will furnish the necessary transportation.

By command of BRIGADIER GENERAL MERRIAM:

THOMAS H. BARRY,
Assistant Adjutant General.

The following were my special instructions:

HEADQUARTERS DEPARTMENT OF THE COLUMBIA,
VANCOUVER BARRACKS, WASH., *March 24, 1898.*

CAPT. E. F. GLENN, *Twenty-fifth Infantry,*
Commanding Alaska Exploring Expedition No. 3,
Vancouver Barracks, Wash.

SIR: Herewith inclosed you are furnished copies of letter of February 24, 1898, A. G. O.; telegram of March 5, 1898, from Headquarters of the Army, and letter of March 19, 1898, from these headquarters to the commanding officer district of Lynn Canal, for your information and guidance in connection with G. O. No. 8, c. s., these headquarters, in which is outlined the work assigned you and its relation to the other expeditions.

As to the Indians you are authorized to enlist, men suitable to your purpose should be employed from time to time as their services may be required, and this authority should be granted the officers in immediate charge of the exploring parties of your expedition. Prompt report of all enlistments will be made to these headquarters.

Blue prints of maps recently compiled covering the territory assigned for exploration and embodying the latest information will be obtained from the engineer officer.

A small amount of relief stores will be taken with your expedition with which to relieve any destitute persons encountered.

It is expected that the work assigned your expedition will be completed by the latter part of September, when all connected therewith should be at Cooks Inlet, when arrangements will be made for returning your party to these headquarters.

After your exploring parties connect on the Tanana or Yukon with Expedition No. 1, they should return to Cooks Inlet by the same or, preferably, a different route, if any be practicable.

En route to Alaska you will command Expeditions Nos. 2 and 3, and will render such assistance as may be necessary to the establishment of Expedition No. 2 at Valdez Inlet within the time and means available, and without delaying your departure thence to Port Wells or vicinity.

Please send a full report with return to the steamer *Valencia*, noting especially any insufficiency of supplies or equipment and the results of the efforts to procure moss for reindeer at Haines Mission.

En route to Dyea you will touch at Haines Mission and satisfy yourself that proper steps are taken to have the reindeer and attendants for Expeditions Nos. 2 and 3 ready to embark on the return of the steamer from Dyea.

You will report to these headquarters by every opportunity as to the progress, conditions, results, and all information concerning your expeditions.

The chief quartermaster will furnish you $500 "transportation" and $400 "incidental" funds, to meet contingencies of your expedition chargeable to those appropriations.

By command of BRIGADIER GENERAL MERRIAM:

THOMAS H. BARRY,
Assistant Adjutant General.

The letters hereinabove referred to are hereto appended and marked, respectively, Exhibits A, B, and C:

[EXHIBIT A.]

[777 D.C., 1898.]

WAR DEPARTMENT,
ADJUTANT GENERAL'S OFFICE,
WASHINGTON, *February 24, 1898.*

COMMANDING GENERAL DEPARTMENT OF THE COLUMBIA,
Vancouver Barracks, Wash.

SIR: Referring to the three expeditions to Alaska now in course of preparation, namely, that from Lynn Canal district, that over the Copper River route, and that from Cooks Inlet, the Secretary of War desires me to communicate the following instructions for your information and guidance:

One of the objects that must be kept in mind in these expeditions is, that all the information valuable to the development of the country regarding topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military posts, mineral resources, timber, fuel, products, capability of sustaining stock of any kind, animals, etc., should be collected and embodied in a report, with necessary accompanying maps and plates, to give the Department information on which to base its action, and the public as full an understanding as possible of the resources, etc., of the country. All three of these expeditions should be charged to collect this data. It will probably be advisable for the main relief expedition, from time to time, to detach parties for obtaining such information from localities not covered by the main party. It is desired that the exploration of Alaska over the routes of travel, and to include as much as possible of the country between the Yukon and Tanana rivers, be covered by the explorations of these three expeditions, in addition to affording relief to those in distress, as heretofore ordered.

It is expected that the officers and men of the three expeditions will probably return down the Yukon to St. Michael, and by steamer from there to the States, unless some more advantageous arrangement can be made, when the contemplated work is finished, garrisons for any new posts in Alaska to be provided by detail of other troops.

Very respectfully,

SAM'L BRECK,
Adjutant General.

[EXHIBIT B.]

[Telegram. 865 D.C., 1898.]

WASHINGTON, D. C., *March 5, 1898.*

COMMANDING GENERAL DEPARTMENT OF THE COLUMBIA,
Vancouver Barracks, Wash.

By direction of the Secretary of War, the following instructions will embrace with the orders heretofore sent, making more definite the design of the Government in regard to the military expeditions and explorations

in Alaska during the present season, the coming summer, and preparations for next winter.

The command to be divided into three expeditions:

1. Expedition No. 1 to proceed from Skagway or Dyea, along the Dalton trail or down the valley of the Yukon, to Dawson, furnished with sufficient supplies for their own use and a small amount for distribution, and a liberal quantity of medical stores, to afford relief to any citizen that may be found in a totally destitute condition. This expedition will be expected to establish a military camp at some point on the Upper Yukon in United States territory near the Canadian boundary. The expedition will thence proceed to discover and explore and mark a trail from the Yukon up Forty-Mile Creek to the Tanana, as it is understood there is a practical route traveled by Indians on that line. It will then explore the valley of Forty-Mile Creek and the country north in the vicinity of Tanana Hills. Its district of exploration will not be limited except by the valley of the Forty-Mile Creek on the south, the Yukon on the east, and Tanana to the west. It will also endeavor to communicate with Exploring Expeditions Nos. 2 and 3.

2. Expedition No. 2 will explore the valley of the Copper River and tributaries from its mouth to the Tanana River, establishing a line of communication to the junction with Expedition No. 1, on the Tanana.

3. Expedition No. 3 will start from some point on Cooks Inlet or the waters emptying into Cooks Inlet, and endeavor to discover the most direct and practical route from tide water to the crossing of the trail between Copper River and Forty-Mile Creek on the Tanana. A route is reported to have been discovered along the headwaters of the northern tributaries of Copper River and near the base of the Alaska Mountains. The district of observation for Expedition No. 3 will be the route indicated and the country north between that and the Tanana and Yukon rivers. Passes through the Alaska Mountains should be discovered if existing.

You are authorized to enlist 150 Indians, and make such details of officers and soldiers as may be necessary to carry out these instructions, but it is thought that from 75 to 150 men will be ample for this purpose.

The details concerning the personnel, supplies, transportation, etc., are left to your best judgment.

By command of MAJOR GENERAL MILES:

H. C. CORBIN,
Adjutant General.

[EXHIBIT C.]

HEADQUARTERS DEPARTMENT OF THE COLUMBIA,
VANCOUVER BARRACKS, WASH., *March 19, 1898.*

COMMANDING OFFICER DISTRICT OF LYNN CANAL,
Dyea, Alaska.

SIR: The department commander directs that you hold in readiness for service with Exploring Expeditions 2 and 3—

(*a*) Lieutenant Learnard and the remainder of Captain Eldridge's detachment—i. e., five squads, 30 enlisted men, and all the special equipment not taken to Pyramid Harbor·

(*b*) Assistant Surgeon Kulp, Acting Hospital Steward Cleave, and two privates, Hospital Corps (Comerford and Kuhlman, if available), with complete medical outfits for Expeditions 2 and 3.

All the above to be fully equipped, supplied, and rationed to include June 30.

The transportation for Expeditions 2 and 3 will consist of 100 reindeer, with proportional number of sledges and drivers (50 for each expedition), to be shipped from Haines Mission on steamer *Valencia*, about April 5, to Valdez and Cooks inlets.

Fifty reindeer will be reserved for a geological surveying party and the remainder of the reindeer train will serve as transportation for Expedition No. 1 to its depot on the Yukon.

About fifty-five Lapps are with the reindeer train en route to Haines Mission, rationed approximately to include June 15 next. The department commander directs that ten tons of relief subsistence supplies, in addition to the five tons ordered by letter from these headquarters of 12th instant, be sent to Haines Mission from Dyea, from which the reindeer attendants are to be rationed to include August 31, 1898, the date of their probable arrival at St. Michael. The remainder of the relief stores sent to Haines Mission not necessary for these issues will be taken with the trains to relieve any destitution, etc., encountered en route by either expedition. Captain Brainard will be in charge of relief stores with Expedition 1, and will make the necessary issues to all the attendants.

The balance of the relief stores now at Dyea will be transferred to Captain Ruhlen, by whom they will be sold, as directed in telegraphic instructions from the War Department (copy herewith).

Dr. Sheldon Jackson will be at Haines Mission to superintend the assignment and distribution of the reindeer, as outlined above.

The 100 reindeer selected for Expeditions 2 and 3 will have to go out on the Dalton trail far enough to gather moss necessary for their voyage to Valdez and Cooks inlets, to be back at Haines Mission for embarkation on steamer *Valencia* about April 5.

Acknowledge and report action.

Very respectfully, THOMAS H. BARRY,
Assistant Adjutant General.

HEADQUARTERS DEPARTMENT OF THE COLUMBIA,
VANCOUVER BARRACKS, WASH., *March 23, 1898.*

Official copies respectfully furnished Capt. E. F. Glenn, Twenty-fifth Infantry, for his information and guidance in connection with his duties under G. O. No. 8, c. s., these headquarters.

By command of BRIGADIER GENERAL MERRIAM:

THOMAS H. BARRY,
Assistant Adjutant General.

NARRATIVE AND RECORD OF EVENTS.

In compliance with the foregoing instructions, I left Vancouver Barracks, Wash., on April 6, 1898, and arrived in Seattle on the following morning.

Capt. W. R. Abercrombie, Lieuts. P. G. Lowe and J. C. Castner, U. S. A., together with the geologists, guides, etc., assigned to the expeditions had been in Seattle for some days attending to the final preparations for our trip. I found all of our freight piled up on the wharf ready to be loaded as soon as our vessel arrived from San Francisco, which she did immediately after breakfast. Accompanied by Captain Abercrombie I made an inspection of her. After this nothing remained to be done except to procure a few articles of personal apparel suitable for service in the Arctic.

Although the climate of Seattle is exceedingly mild, not only did all members of Expeditions Nos. 2 and 3, but hundreds of others, appear on the streets in their "Klondike" suits. These suits, by the way, varied in color and material in accordance with the tastes of the owners, and, in the light of subsequent information, many of them were as ill adapted to use in Alaska as furs are in the Tropics.

Lieut. R. M. Brookfield, U. S. A., with a detachment of the Fourteenth Infantry, arrived by the afternoon train, and was immediately taken on board.

At 10.25 p. m., everything being loaded and our ship's papers adjusted, the good ship *Valencia* backed away from the dock and we realized that we were off for Alaska.

During the night we turned out of Puget Sound into the channel of what is known as the "inside" passage, so called to distinguish it from the open-sea voyage via Sitka, that is called the "outside" passage. The former has been described frequently. But the grandeur and picturesqueness of the scenery is beyond description, and must be seen to be appreciated. On either side of the channel, which is very narrow and contracted in many places, rugged, snow-capped mountains come abruptly down to the seashore.

We arrived at Haines Mission about noon of April 12, to find Expedition No. 1 encamped there. We at once interviewed the commanding officer, and also Mr. Kjellman, in regard to the 100 reindeer that were intended for the use of Expeditions Nos. 2 and 3. Both of these gentlemen informed us that these deer were totally unfit for use, and that another sea voyage would result in the loss of practically all of them. It was also reported to me that at that time 36 head had died and that the condition of the entire herd was most critical. This subject I learned had been reported to proper authority

by Dr. Sheldon Jackson a few days before my arrival, so need not be gone into further herein.

The Geological Survey party, to whom 100 of these reindeer had been assigned for exploring purposes, had abandoned the idea and proceeded to Skagway to procure other transportation.

I did not attempt to make a personal examination of these animals, but assumed from the foregoing information that their condition was as represented to me. It was apparent, therefore, that both expeditions under my charge were without transportation of any kind, and our only hope of securing any was to go to Dyea, where a large train of pack mules had been sent for the purpose of transporting "relief" stores to the Klondike region, and make application for a limited number of them.

The storm raged so furiously during the nights of the 12th and 13th it was impossible to quit the harbor. The wind blew with such terrific force it lifted the water from the surface and carried it in sheets up the canal.

As there was a slight cessation of the storm about daylight of the 14th, we raised anchor and steamed to Dyea, arriving there about 7 a. m. We tied up at the dock, a very good one, and proceeded over the trail, a very rough wagon road, for a distance of 3½ miles to the camp of Col. T. M. Anderson, Fourteenth U. S. Infantry, who was in command of the district of Lynn Canal.

As soon as practicable after our arrival, Captains Abercrombie and Eldridge, whom I had asked to accompany us to this point in order to explain to Colonel Anderson the true condition of the reindeer, and myself had an interview with him. After representing fully the condition in which we found ourselves in regard to transportation, I urged upon him the advisability, and as we believed the necessity, of our being furnished with pack animals from the train under his charge. It was a matter of great regret to all of us that he would not assume the responsibility of furnishing us with any of these animals. The reason assigned by him for not doing so was that he had positive orders by the same mail, from the Commanding General of the Army, to ship this pack train back to Seattle, Wash.

At this point we took on board the enlisted men that had been assigned to Expeditions Nos. 2 and 3; also Lieut. Guy

V. Preston, Ninth U. S. Cavalry; H. G. Learnard, Fourteenth U. S. Infantry, and Asst. Surg. J. S. Kulp, U. S. A.; all of whom had been assigned to duty with Expeditions Nos. 2 and 3.

We were also to receive at this point a quantity of relief and other stores, all of which had been loaded upon a lighter and was ready to be taken on board the *Valencia* as soon as the tide came in sufficiently to float the lighter, at this time hard aground.

The beach here has quite a gradual slope (the distance from the point where the lighter was lying to the dock is about 3 miles), and to move these stores the tide must have passed the flood so as to float the lighter down with the ebb. The wind had not yet abated, and caused much damage to the stores by reason of the salt water breaking over the sides of the lighter. It also caused much delay in floating down to our vessel. We were detained on this account until about 10 p. m.

At this time the town of Dyea contained a population of probably 1,500 to 2,000 souls. Besides, there was a constant stream of people on the trail leading up to "Sheep Camp," and from there on over the pass.

Just before our arrival occurred the memorable snowslide that caused the death of nearly 100 people. Fifty-six bodies had been removed at the date of our arrival, but the work of removing them, for some unknown reason, had ceased. This accident, which, by the way, had been foreseen and predicted by the Indians who were packing over the trail, undoubtedly had a controlling effect on turning the tide of prospectors toward the city of Skagway.

The city of Dyea at this time contained but few houses that were substantially built, and the floating population was not made up entirely of the best families. In fact, the principal occupation of the troops located there seemed to be breaking up the well-known "safe games." The principal one of these for entrapping the unwary was the so-called "shell" game. The operators of these games became so bold, in fact, that the men were actually "held up" on the trail, frequently assaulted with a dangerous weapon, and robbed, if they refused to stake something on the game.

Immediately after taking our freight on board, we steamed down the canal to Haines Mission, where we cast anchor about 3.30 a. m. I at once sent Lieutenants Lowe and Castner, with

two scouts, to look up Mr. Kjellman, and the reindeer I had left orders should be within easy reach of the beach upon my return. This order was given to avoid delay in loading them in case we failed to get the mules at Dyea. After a long walk over a very rough trail, these gentlemen returned about 10 a. m., and reported that the deer would be at a certain point early in the afternoon. Accompanied by Captains Abercrombie and Eldridge, we went at the time mentioned to the place designated and remained there until about 6 p. m. No deer put in an appearance, and nothing had been seen of Mr. Kjellman since the early morning. So we returned to the beach, where I ascertained from reliable sources that the herders had tried but were unable to bring in the reindeer, and that they probably could not get them in within twenty-four hours.

In the meantime the lighter brought down from Dyea had been loaded with the necessary reindeer sleds, harness, etc., and also a certain lot of commissary stores intended for the command. I was engaged in unloading the sleds, etc., when a letter was handed me from the captain of the *Valencia*, in which he stated that he intended to sail that evening at 8 p. m. I at once carried alongside and loaded on the *Valencia* the commissary stores referred to, although they were so badly damaged as to be unfit for use, due to improper protection from the elements. This done, I informed the captain that I was ready to sail.

In this connection I beg to state that, according to the best judgment of myself and the officers of the command, as well as that of others who had seen and were familiar with the condition of the reindeer, it would be useless to depend upon them as a means of transportation in the condition in which they then were.

Although these two expeditions were without any means of transportation whatever, I did not feel warranted in holding the vessel any longer, and so made application to have pack animals sent up by the next steamer.

We sailed the following morning (the 16th instant) down the Lynn Canal, thence through Icy Straits and Cross Sound to the open sea, and thence to Hinchinbrook Island. It was during our passage across this open sea that we struck our first really rough water; and the rolling, corkscrew motion of the vessel caused all the members of the command to

be seasick. This condition, however, only lasted during about eighteen hours, when we arrived at Nuchek and smooth water.

We reached Orca, at which point is located one of the canneries of the Pacific Steam Whaling Company, of San Francisco, Cal., early in the morning of the 18th, and landed there about 150 white men and Chinamen, employees of the cannery, together with their personal baggage.

At 1 o'clock that afternoon we sailed for Valdez Inlet, where we arrived the same evening and cast anchor at a point known as Swanport, which is just across the inlet from what was then called Copper City, but now Valdez.

Captain Abercrombie insisted upon having his stores unloaded on the other side, so on the following morning we steamed up the bay for about 2 miles and commenced the serious work of unloading. All assistance practicable was rendered Expedition No. 2.

The method of unloading stores was a difficult one and entailed very hard work upon all concerned. It consisted in first transferring all freight from the *Valencia* to lighters (stern-wheel, flat-bottom boats), which, when loaded, were sent as close to the beach as practicable, where they went aground as soon as the tide ran out.

So eager were the passengers to get their freight ashore, and the officers of the vessel to get rid of their cargo, that all hands actually commenced carrying their freight from the lighters while the water was still up to their waists. All freight had to be placed on top of the snow, which at this time was about 10 to 12 feet deep on the level, in order to protect it from the salt water. Many of our packages were so bulky and heavy that real hardship was imposed on us in having to lift them onto the snow bank after carrying them by hand for about 300 yards through the water and mud.

The captain of the *Valencia* informed me that he intended to send Expedition No. 3 and such passengers as he had for Portage Bay to that point, on board of the steamer *Salmo*, that afternoon. I at once caused all of our freight to be transferred to that vessel, and 14 members of the expedition, under charge of Lieutenant Castner, to proceed at daylight on the following morning for Portage Bay, where he was to select a suitable camping ground, unload the freight, and pitch camp.

As we did not finish discharging the cargo until the afternoon of the 21st of April, ample opportunity was afforded for investigation of the conditions existing at Valdez. In this town was located at this time about 100 people, in addition to the 200 that had been fellow-passengers with us on board the *Valencia*, and also in addition to those who were engaged in trying to transport their goods over the Valdez glacier. Of the latter class, I was reliably informed, there were about 3,000, who were distributed about as follows: Between 250 and 300 had succeeded in crossing the glacier and were in camp on or near Lake Abercrombie on the other side. The remainder were distributed from the summit of the glacier down to the city of Valdez. It is needless to say that most of those going over the glacier were men. Although there were quite a number of women as well, most of these had doffed their usual costume and were to be seen in men's apparel, working alongside of their partners helping to drag their sleds, and generally doing their full share of the work.

The difficulties encountered in crossing this glacier, which is 29 miles long, were fully set forth by these people, and I assume will be fully treated by commanding officer of Expedition No. 2.

On the day of our arrival at Valdez, or within eight or ten hours after the first lighter went ashore, I discovered that one of our fellow-passengers had opened a saloon, exposing for sale intoxicants of all sorts. This was not the only saloon in the town. And I had observed that intoxicating liquors were sold openly at Dyea. Now, the sale and importation of intoxicants of all sorts in the District of Alaska is prohibited by law, yet, as stated, it was openly sold and the law violated on every hand. This condition is unfortunate, to say the least, since it implies that the eyes of officials charged with the enforcement of the law must be closed somehow.

That stimulants are frequently desirable and sometimes necessary for people in Alaska is self-evident, and it is to be hoped that in the near future the importation and sale of it in that District will be duly authorized and regulated.

I will add here that during my sojourn in that Territory I frequently saw the natives (Indians) under the influence of strong drink, and was impressed with the great difference in its effect upon them from that observed upon the American

Indians in the United States proper. The Alaska Indians, or at least those with whom I came in contact, do not become violent and warlike when intoxicated. On the contrary, they tend rather to stupidity and good nature.

Shortly after noon on the 21st we sailed for Orca, where the steamer *Salmo* was expected to meet us. We arrived at this place at midnight. While waiting for the steamer *Salmo* to put in her appearance ample opportunity was afforded for examining the cannery located there. Its capacity is 50,000 cases per annum. It employs from 125 to 150 men, about 60 of whom are Chinamen, who perform all work in the cannery—making, packing, labeling the cans, and boxing them for shipment. The remainder of the force are fishermen and boatmen. The greater portion of the fish are caught at the mouth of Copper River.

The order directing Expedition No. 3 to explore Port Wells and adjacent inlets was based upon a story told by our guide (W. H. Howe) to the commanding general, Department of the Columbia. He stated that he was for some years a trader among the Knik Indians. While so engaged these Indians had repeatedly requested him to establish a trading store on Port Wells Inlet. He had never been to that inlet and knew nothing about it. The above-mentioned request convinced him that there must be an outlet from it to the Knik Arm.

Compliance with my instructions necessitated the use of a steam vessel, and I chartered the steamer *Salmo*, from the Pacific Steam Whaling Company, for this service.

On April 23 we were up and ready to sail at 6 a. m., but were delayed waiting for our engineer until 9.30 a. m. This, combined with the ignorance of the crew of the waters of Prince William Sound, caused our party and the 30 passengers who sailed with us to Portage Bay to pass a most uncomfortable night lying at anchor within 5 miles of our destination. The night was very cold and there was no place on board to sleep.

We arrived at our camp, located by Lieutenant Castner on the south side of Portage Bay, 1¼ miles from the head of the bay, in a very nice grove of spruce timber, about 6 a. m. This camp had been very well selected, as we had a stream of nice, clear, running water within easy reach on each side of us, plenty of fuel, and were well protected from the severe

winds that blew across the glacier either up or down this arm of the sea.

The bay is inclosed by immense glaciers and snow-capped mountains. It is about 10 miles long from Point Pigot to its head. It has sufficient depth of water for all-sized vessels, and two or three harbors, well protected and affording good anchorage. At this time the snow was 7 or 8 feet deep on the lowlands.

At the head of this bay commences the regular winter trail utilized by people of the Sunrise mining district. The glacier separating this bay from Turnagain Arm is only about 5 miles across. It is not very high and is a perfectly safe and feasible route for traveling during the winter months; but, like all other glaciers, during the summer months, when the snow had melted, the crevasses appear and render travel over them both difficult and dangerous. The entire distance from Portage Bay to tide water on Turnagain Arm is about 12 miles.

Although Lieutenant Castner and party had accomplished a great deal toward rendering our camp habitable, there was still much to be done, and my presence in camp was absolutely necessary in order to get it in working order and to get ready for the trip to Port Wells Inlet on the following morning. Then, too, the wind blew with such terrific force from the Turnagain Arm during the entire day that the sky was filled with flying snow to such an extent as to shut out the sun from view. So furious was this storm that I directed that none of the people encamped near me should attempt to cross the glacier until it abated. The time was consumed in opening up and examining our supplies.

In the afternoon the surgeon reported to me that after carefully examining his medicines he discovered that the articles which belonged in the chest had been removed and others substituted for which we would have no use whatever. Attention is called to this fact so that in future, should a surgeon be sent to that country, he should be required to specify what medicines are essential, and only such should be taken along.

On the following morning I managed to get my party and freight on board the *Salmo* a few minutes before 6 a. m., the hour set by the captain for starting, only to find ourselves hard aground. This was all the more provoking because the captain of the boat knew exactly how much water his vessel drew and had been sounding all around it for at least an hour.

I had just resigned myself to a delay of several hours and was busily engaged eating my breakfast when the tide ran out, the boat suddenly listed to the starboard and scattered all of the breakfast, plates, dishes, etc., and ourselves in a confused heap upon the deck. A boat whose deck lies at an angle of 60 degrees is not a comfortable resting place, so I took the party ashore until the tide turned and again floated the boat.

At 1.30 p. m. we sailed for the mouth of Port Wells, which inlet runs in an almost northerly direction. Its mouth is separated from the mouth of Portage Bay by a sort of cape, known as Point Pigot.

After passing Esther Island, which lies in Port Wells Inlet, near its mouth, we traveled for about two hours, when we came to an arm of this inlet that comes in from the northwest, at the head of which is a very large glacier, named "Barry Glacier," after Col. Thomas H. Barry, assistant adjutant general, U. S. A. Barry Glacier is one of the most formidable as well as the most interesting of any we have seen. The length of this arm is about 15 miles. Coming out of it we saw immense icebergs that had evidently broken off from the glacier. Many of these were from ten to twenty times as large as our boat.

About 7 p. m. the same evening we cast anchor in a very well-protected bay on the east shore. Into this bay flows a creek of beautiful, clear water. There is a valley of about 3 miles in width at this point, but its length we were unable to determine on account of the severe snowstorm that came up just at this time and shut off our view. The beach is a gradual slope of gravel and affords good anchorage.

On the following morning, after a run of two hours at half speed, we came to the head of Port Wells Inlet. Here we found considerable sea. The east shore seemed to be clearer, so we ran up on that side, where we found, close to the shore, a good gravel beach, with excellent anchorage in about 5 fathoms of water. The day was dry and clear. Directly in our front was the most imposing sight we had yet seen—I might add more imposing than any we saw during the season. Glistening in the sun were two large glaciers, which we named the "Twin Glaciers," the pair being separated by a short ridge or hogback that runs down to salt water. In front of the one on our right the sea ice extended for over 3

miles, while in front of the other this sea ice extended at least twice that distance. This ice was covered with snow several feet in depth. We soon discovered that it would bear up the weight of a man and that we could make no headway against it with the boat. Each of these glaciers is what is termed "live" or "working" glaciers. The front of each was an almost perpendicular mass of ice, from which immense pieces were constantly breaking off and falling into the sea with a great roaring noise, due principally to the action of the tides.

At the upper extremity of the hogback these glaciers apparently join and cross each other, and extend to the summit of the distant mountains at least 40 or 50 miles. The maps show these mountains to be 10,000 feet high. While I was not prepared to determine their exact altitude, yet, from a careful examination of them at this time and subsequently from the other side of the coast range, while in the interior of Alaska, I feel satisfied that the estimated height is nearly correct. There are several peaks at this point of about the same altitude.

All of our party, excepting myself and the boat crew, made a trip up on the right-hand glacier for a distance of about 12 miles, and I am satisfied that my estimate of the length of these glaciers can not be far from correct, because this party did not accomplish to exceed one-quarter of the distance from its base to the summit. Late in the afternoon I felt somewhat uneasy about them, so took the two small boats up to the edge of the sea ice, a fortunate step, because the tide, having come in in the meanwhile, had cut them off from the shore by a stretch of water that was too deep to wade and too cold to swim.

This was one of the best locations for studying the actual formation of glaciers. In addition to the "Twins," there were, in full view on the west shore, between each pair of peaks, six well-defined glaciers apparently under process of formation. The snow from these peaks, in the spring of the year, slides down into the ravines or low ground between them and carries with it everything in its path, including immense bowlders, trees, etc., all of which lodge in the ravines below, where a great part of it becomes congealed, not only from its own weight (I am informed that snow will congeal from its own weight at a depth of 40 feet), but from the action of the weather as well.

As often as two or three times every hour during the day we saw and heard these snowslides, the noise of which, alternating with the noise caused by the falling of the immense ice floes from Barry Glacier, could be heard like the rumbling of distant thunder and which seemed to shake the mountains on either side of us. We must have been at least 15 miles from Barry Glacier, and yet we could distinctly hear the icebergs falling from it into the sea.

The party that climbed the Twin Glacier made use of the Canadian snowshoes with which we were equipped for service in this expedition, and each of them joined in condemning them as a means of transportation over the snows in Alaska. They are too short, too broad, and too flat. All of this party were terribly sunburned. Lieutenant Castner, who had attempted to use his snowshoes with his rubber wading boots on, succeeded in rubbing off a good part of the great toe on each foot.

After dinner we sailed back to the mouth of the small creek so as to be ready to make an examination of it on the following day. And although we were treated to a northeaster and a blinding snowstorm, I sent Messrs. Kelly, Lampe, and Mendenhall up the creek, giving them one day's rations. After passing up this creek for a distance of about 3 or 4 miles, they found that it flowed out of a lake frozen sufficiently for them to pass over it. Having reached the head of it (it is about 3 miles long), the storm continuing unabated, they decided that it was useless to proceed farther, and so returned to the boat.

The remainder of the party consumed the day in hunting ducks and geese, of which there were a large number in the bay. The gravel in the creek indicated the presence of gold, but we were unable to find any colors when we panned some of it.

The snow continued to fall during the night, with no prospect of letting up on the following morning, so that an attempt to explore was futile.

I determined to steam down the inlet and if possible pick up the head of Esther Island, or at least determine if there was an island as indicated on the chart. About an hour after starting I entered a small, narrow inlet, little dreaming that it was the head of Esther Island. But such it later proved to be. The distance to this place from Point Pigot being

about 9 miles, confirms the correctness of the chart both as to the distance and location.

As there was no prospect of the storm abating, and having reason to believe, from information received, that the steamer *Excelsior* had put into Portage Bay with mail for myself and party, also being desirous of sending Lieutenant Learnard with a party over the Portage Glacier into Cooks Inlet country, I decided to run up to camp, 10 miles distant. We arrived there about 9 o'clock the same morning.

The citizens who came over from Orca with me went into camp in the same grove as myself, and were unable to get up to the head of the bay with their rations and camp equipment on account of inability to get over or around a rocky point that stood out into deep water. As I had to use the *Salmo* to send supplies for Lieutenant Learnard's expedition at the head of the inlet, I gave them authority to move their freight at the same time. Lieutenant Learnard's detachment was ordered to cross the Portage Glacier and ascend Twenty-Mile River to find, if practicable, a route from Portage Bay to the Knik Arm.

After getting this party off, I again steamed out of the bay, skirted along the south shore of Esther Island, and about 7 p. m. ran into a nice harbor known as Sea Lion Bay. The chart showed that this section of Prince William Sound is full of dangerous rocks, and, as these waters were unfamiliar to the members of my crew, I considered it wise to tie up our boat for the night.

The storm continued during the night of the 28th. On the morning of the 29th a heavy snowstorm prevented any work of exploration. We therefore decided to steam to Valdez Inlet and arrange with the agent of the Pacific Whaling Company for the further use of this or some other boat (I had agreed to return the *Salmo* on April 30).

About noon we found our engine in bad condition, but we managed to reach Valdez about 3 p. m. Here we found all of Expedition No. 2 except Lieutenants Lowe and Brookfield.

There was a fall during the day of at least a foot of snow. On the following morning I measured the depth of the snowfall during the twelve hours of the night, and found it to be 14 inches. On the surface of the salt water of the inlet there lay from 18 to 20 inches of unmelted snow. It was still falling, and the air was so full of it that the captain of the *Salmo*

was afraid to venture out of the harbor at Swanport, and this notwithstanding the fact that it was unaccompanied by wind.

While here I learned that Expedition No. 1 had been abandoned, an action I fully expected. It was here also that I first saw a horse using snowshoes, made of hay and gunnysacks. The poor beast not only handled them very well, but seemed to appreciate the fact that they were put on for his benefit. The snow was so soft that he broke through it every few steps, severely wrenching himself, despite the precaution taken.

Notwithstanding the difficulties attendant upon the use of stock during a few hours each day, there is no question but that had Expedition No. 2 been supplied with mules at Dyea, as requested, practically all of the stores needed for the summer's work of the command could have been well over the glacier by this time.

The snow having changed into rain during the night of the 30th, we sailed on May 1 for Orca. During our passage to that point we encountered a fierce gale of wind, against which we could not make to exceed 2 knots an hour for two or three hours, but finally reached our destination about the middle of the afternoon.

Learning that it was impossible to secure the services of the steamer *Salmo* for further exploration, I called upon the agent of the Alaska Packing Association and engaged from him the steamer *Pacific*. She was forced to take on coal and did not report until the afternoon of the following day. We then again steamed for Portage Bay.

We cast anchor for the night at Fox Island. On this island Mr. Story, the agent of the Alaska Packing Association, and some others are engaged in raising foxes. I learned that they pay the United States for the use of this island an annual rental of about $100, and that their plant, including the foxes placed there, had cost them $12,000, with practically no return up to this (third) season. They expect to utilize some of their increase this year. At their last inventory they had on hand about 300 head. The theoretical increase of these animals is seven per female per annum, though they are amply satisfied if they succeed in raising five. Although these animals run wild on the island, they can be caught readily and without injury. To do this they make use of what is known as a box trap, from which they select the

males and release the females. The pelts of these animals (blue fox) are valued at about $12 to $15 each. Of course the pelt of the silver-gray fox is much more valuable than that of the blue fox, but all attempts at raising them have been unsuccessful, as they multiply little if at all under confinement. It is stated also that they destroy their own young. This company procured a few of them when first incorporated, but subsequently killed all that they had placed on the island. The blue fox is permitted to run wild on the island, but are regularly fed on fish. Procuring the fish entails the principal expense connected with their propagation.

On the morning of May 3 we sailed for Unaquig Inlet, which is to the eastward of Port Wells Inlet. Near the head of it is Miner's Bay, and into this empties the small stream known as Miner's River. When we arrived at the head of this inlet we found it divided into two arms, both of which were frozen over. The ice was largely slush, not strong enough to bear the weight of a man, yet we tried several times to break through it with the bow of the steamer, which was very sharp, without success. We were unable, therefore, to get to the solid ice beyond this slush, and to get around the shore was not only very difficult but would result in no special good further than gratifying our curiosity to examine the glaciers that lay at the head of the two arms.

Then, too, the rain and fog prevented us from seeing very far into the mountains, but far enough for us to determine that no outlet exists at or near the head of this bay.

We then steamed back a short distance to what is called Cowpen Bay, at the mouth of the Cowpen River, for the purpose of getting some fresh water for our boilers. We had just gotten into the mouth of the stream, and had been examining the country a few minutes, when we found our vessel had swung around and was resting on a rock. We were fortunate in that it was lying on an even keel and would not therefore suffer any damage. By the judicious use of some loose boards we had on the ship, and just before she listed, we managed to protect her sides from the rough surface of the rock. As the tide would not come in sufficiently to float us until about 10 o'clock that evening, we explored the Cowpen River, and hunted the rest of the afternoon and evening. After the tide had gone nearly out it was discovered that the vessel had sprung a leak, but our courage did not desert us,

as we were on terra firma and safe. As the captain was very much exercised about the leak, and as this was not a suitable place for repairing it, we decided to return to the permanent camp where the vessel could be safely beached.

In the evening about 10 p. m. we pulled out of the mouth of this stream and into the bay, where we lay at anchor to await the turn of the tide, which was then running in so rapidly we could gain nothing by trying to steam against it.

We were to start again at 12.30 a. m., but did not get under way till 2.30 in the morning. We had scarcely started when I was aroused by a very sudden and unmistakable jolt, and realized that we had struck a rock, as we were not moving. A glance from my berth showed me that all on board realized the situation and were prepared to spring from their berths if necessary. Just then the captain opened the hatch and in great excitement informed me that we had struck a rock in the middle of the channel and that he could not move the vessel. All hands dressed themselves with despatch, but there was no confusion. I suggested to the captain that he ascertain if our boat had sprung a leak and if we were lying on an even keel. Our good luck remained with us, as we soon learned that the vessel was not likely to be strained in her present position, and the old leak, no more serious than on the day before, was being kept under control by the pumps.

Of course no blame can be attached to anyone for this mishap, because we were as near the center of the channel as it was possible to get. The rock struck was hidden and could not possibly have been seen even if it were not a foggy night. Besides, this channel was new to the captain and all the members of his crew.

The tide at this inlet runs at the rate of 10 knots an hour. This appears to be an extremely swift current to one on board of a helpless ship. As it would be some hours before the tide turned enough to float the ship, all of my party turned in until morning.

The current of the flood seemed stronger even than that of the ebb, and when the vessel finally floated it was hurled back with great force against some rocks we had passed during the night, striking first the stern and then the bow, carrying off about 15 feet of her keel. This lasted only a few minutes, and we were soon steaming down the inlet.

Soon after turning into the bay we passed a small place known as Thlinket, where some Indians live. Three short whistles of our steamer called out a bidarka, in which were three Indians. Among them was Nicolai, who had been recommended to me as possessing intimate knowledge of the country at the head of Port Wells Inlet. He readily consented to come aboard our vessel and accompany me to the camp to guide the party up to that section. He informed me that he was familiar with the river or small creek that we had tried to investigate on the first trip up that inlet; that it was a good hunting ground, especially for bear, but he was satisfied that it afforded no feasible route into the interior.

From him I also learned that twelve men lived at his village. There were seven families, in three of which there were thirteen children, and in the other four six, making a total of nineteen children. Their houses were single story, log and frame combined, of the same general class as I subsequently found in Cooks Inlet.

The three of these Indians that I saw gave every evidence of being very poor and of suffering from hunger. They were thinly clad. Nicolai himself had on two cotton shirts which hung outside of his trousers. His hat had been in service for years. He had on neither shoes nor stockings. He, like all of his companions, was small in stature, being about 5 feet 2 or 3 inches in height. All of them appear to be consumptive. His effects, when thrown upon the vessel, consisted of a pair of worn-out shoes and one or two minor articles rolled up in a goatskin. The latter, unfortunately, did not inclose the aroma; more's the pity!

We arrived in camp early in the afternoon, to find the snow on the glacier and in the flat back of the camp melting rapidly. The water had forced its way underneath the snow, completely submerging several of our tents, my own among the number. So rapidly did the water come into the opening in which the tents were pitched that it stood at a depth of about 3 feet inside of the tents before one had time to remove anything. The party in camp worked all the remainder of the night and forenoon upon a ditch that carried off this water and rendered us comparatively safe from future trouble of this kind. No permanent injury had been done to any of our effects.

At this time I received reports from Lieutenant Learnard, who had crossed the glacier, that were far from encouraging. Having lost some of his rations, he would have been in bad shape indeed had he not been fortunate enough to meet a prospector who very willingly turned over to him all of his rations, with the understanding that the same amount be delivered to him in return at Sunrise City. For some days Lieutenant Learnard had been suffering from snow-blindness. He was affected so seriously that he had to be led back to camp by one of the command. Later information received the same day showed that he was much improved, although his eyes were still in very bad condition. As he had neither medical supplies nor attendants with him, he specially requested that the surgeon or hospital steward be ordered to report to him at once.

Finding the conditions such as to preclude my going to the head of Port Wells Inlet, as contemplated, I directed Lieutenant Castner to take the boat and proceed to that point early on the following morning. In the meantime I equipped the hospital steward with the necessary medicines, which, with his personal equipment, were packed in a Merriam pack, furnished him with snowshoes, and directed him to accompany Mr. Mendenhall across the glacier, where he would report to Lieutenant Learnard. It was necessary to use snowshoes, as the weather was not cold enough to form sufficient crust to bear up the weight of a man.

No one ever seen was so utterly helpless on snowshoes as this hospital steward. Despite all precautions, he persisted in sticking the toe of his shoes into the snow, and about every third step he would step on one shoe with the other, immediately throwing himself headlong into the snow in a mass of helplessness, from which he required assistance to extricate himself. He returned about 4 p. m. that afternoon, having consumed over eight hours in traveling about 2 miles. He had removed his snowshoes, which were dragging behind him on the ground. He waded through snow up to his hips in order to return. Learning from this experience that, as a matter of ordinary precaution, it was absolutely necessary for each and every member of the detachment to know how to use snowshoes, I required the steward and every other man in camp who had not previously acquired this knowledge to use them for a walk of 5 miles every day until all were proficient.

On this date Mr. Hunt, a prospector and miner from Sunrise City, informed me that there was an Indian trail over the mountains from Portage Bay by which one could reach both the city of Sunrise and Knik Arm. While he had never been over the trail, he was informed that it passed over a watershed that separates some stream flowing into Portage Bay from the Twenty-Mile River, that there were no glaciers on this route, and that, in so far as he had been able to ascertain, it was perfectly practicable to the points named. I had previously heard of this, but my information was to the effect that the stream referred to emptied into Port Wells Inlet, near its mouth.

On the afternoon of this day, May 6, I was much surprised to find the steamship *Pacific* steaming up the bay toward my camp, and I confess to a feeling of disappointment, since I knew it indicated that there was no hope of finding a passage through the mountains from any point on Port Wells Inlet.

Immediately upon his return Lieutenant Castner reported that, as the weather was clear when he arrived at the small creek previously investigated, he could see the stream terminated abruptly in a very high and impassable range of mountains, so rugged and precipitous that he did not feel warranted in further investigating them. This reduced the question of an outlet from tide water on Prince William Sound to the interior, either from Valdez Inlet, from the small stream running into Portage Bay, above mentioned, or from Resurrection Bay, which latter I shall investigate en route to Cooks Inlet.

I learned from other sources that the reputation of W. H. Howe, our guide, for veracity was not of the best among his old associates in Cooks Inlet; and the result of our investigation of Port Wells was most unfavorable to him. Not wishing to act hastily, I sent Lieutenant Castner to Sunrise, thence to Tyoonok, to ascertain all he could about this man's standing and character among the people with whom he had associated, and to make inquiry for a suitable person or persons to act in his place by reason of his knowledge of the country we were ordered to investigate.

This investigation resulted in establishing a most unsavory reputation for Mr. Howe. I learned also that he had made one absolutely false statement to Lieutenant Learnard. Subsequently he made one to myself that came near causing the

loss of the lives of two enlisted men of the command. In addition to this unreliability he was densely ignorant of the country he professed to know so much about. His romancing had been exceedingly expensive to the Government, besides causing much hard labor by the command. So his discharge was warranted.

On May 7 Lieutenant Learnard, accompanied by the geologist and five enlisted men, reported to the permanent camp that they crossed the glacier without serious trouble, carrying the sleeping bags and clothing of the men upon a sled which they dragged behind them. He stated that it was impossible to ascend the Twenty-Mile River at this time, on account of the ice gorge near its mouth, which he was unable to get around, and which caused the water to run over the ice and snow throughout the entire valley near the mouth of the stream. In addition, all the small streams were running full of water and much water was underneath the snow, not exposed to view until one suddenly broke through the crust.

It was reported to me this afternoon that a civilian located near my camp was desperately sick with pneumonia, or bronchitis, and that he was not only without a tent of any kind, but did not have sufficient bedding. He was en route to meet a party to which he had been assigned and who were on the other side of the glacier at the head of Turnagain Arm. I caused him to be supplied with everything necessary, including medical supplies, and notified the gentleman in charge of his party of the facts, who sent over members of his party to look after and provide for him.

A small schooner, manned by two squaw men and their wives, cast anchor in front of my camp to secure passengers for Cooks Inlet, but failed to get any.

As members of the party had exposed a number of plates and films, with no idea as to what results had been accomplished, we improvised a dark room for developing them. This was done by sewing together five army blankets and stretching them over a wooden frame. Inside was hung another square made of black canton flannel. The two thicknesses of cloth were necessary to shut out the intense light due to reflection from the snow.

Some prospectors as well as members of the command prospected our present location for mineral, but without success. The indications were that coal will be found in that vicinity.

The bay seemed to be full of several kinds of ducks, geese, and brant. They were so wild, however, that it was difficult to use a shot gun, and rifle ammunition was too scarce to be wasted on such small game. We had no trouble in catching fresh fish. Codfish especially were most abundant.

On May 10 I sent Messrs. Kelly and Lampe across the bay to investigate the outlet near the head of the creek, providing them with necessary rations and tools for making themselves comfortable.

The rainfall had been constant for a week, and the dampness caused several of the men to suffer with rheumatism, myself among the number. But this was the only period that we were at all troubled with sickness.

A stray paper from Sunrise, dated the 25th of April, made its way into camp, and we found in it our first intimation of a call by the President for 300,000 volunteers. It also stated that four Spanish vessels had been captured.

My party had been provided with a sectional steel boat, manufactured at Tacoma, Wash., to be used in cordeling our freight up the streams when we attempted to go into the interior. Having put this boat together immediately upon our arrival at Portage Bay, we found ample opportunity for using it. But we soon discovered that it was not seaworthy when the water was at all rough. I was much inconvenienced by reason of this, as I was compelled to borrow boats from citizens located there in order to send men over to communicate with parties at the mouth of the creek above mentioned, and where I had determined to construct a log cabin for storing commissary supplies and for the accommodation of the men who were sent there from time to time.

After a number of unsuccessful efforts we succeeded in bringing Messrs. Kelly and Lampe back to camp on this date. From Kelly's report I learned that there was an abundance of reindeer moss down near the flat. This is important, in that it shows that not only would there have been plenty of feed for the reindeer had we been able to bring them along, but in a place well protected from storms.

This particular locality is the one that was first selected by Lieutenant Castner for the camp on arrival in the bay, but was abandoned later to avoid being so far from its head. It is certainly the most attractive spot in the bay, situated about 5 miles from my present camp and but little more than that

distance from the head of the bay. It is less than 2 miles wide and about 5 miles deep to the mountains in the rear. Notwithstanding the continued fog and rain, I sent a party, consisting of all the available men in the command, over to this valley to cut logs for building a cabin, considering employment of any kind much better for the men than to lie idle in their tents.

On the morning of May 19 the spirits of everyone rose with the sun, which we had scarcely seen for two weeks. It was a glorious day. We had seventeen hours of sunshine without a cloud in the sky. Mr. Kelly took advantage of it to signal across the bay to us by means of an improvised heliograph. He used a small pocket looking-glass about 1½ inches in diameter. Although he was 5 miles from us, on level ground, we had no trouble in seeing the flashes or in understanding that he wished to be sent for.

Upon his return he reported having discovered at least 100 acres of excellent lumber pine, that stands very thick and which would be very useful for construction of buildings should this ever become the starting point of a trail into the interior. As we did not expect the *Valencia* until the 23d of May, I concluded to give Mr. Kelly four days' rations, with instructions to again go over this trail and push down the valley on the other side as far as possible during the intervening four days before her arrival.

On the 20th of May I received a report from Lieutenant Castner containing much information about the country in the Sunrise mining district, and informing me that he had met one or two men who had been well into the interior and were familiar not only with the Matanuska River but also with the Sushitna River country. I also sent Corporal Young, the hospital steward, and one private, with Guide Howe, across the glacier, with orders to proceed to Sunrise City, reporting to Lieutenant Castner if there, but if not there, with his command, including the men located at Spruce Camp, to Tyoonok, to remain there until my arrival. My object in doing this was to avoid attempting to bring men and stores then in Spruce Camp back across the glacier. A very cold night favored the crossing of the glacier, as it formed a good crust.

A party, including myself, this day made an examination of what our geologist designates a terminal moraine, at the head of the bay. This proved to be one of the most interesting

discoveries we made in Alaska. It consists of a detached or isolated hill not far from tide water, and contains not to exceed 2 acres of surface on its top. It is surrounded at a distance of from 30 to 50 yards from its base with a pile of rocks or bowlders, which evidently marks its original size. From this circle this moraine has gradually receded for a number of years, due to the action of the elements. Within this circle of bowlders others have been deposited, but in no regular order. The top and sides of this moraine are covered with a collection of dirt and stones to a depth of several feet. In the northeast corner there is a circular opening that shows a clear, blue ice. At the bottom of this we discovered two caves running for an unknown distance into the ice. In front of this opening snow has drifted to a depth of 30 to 50 feet, and it was with considerable difficulty that we managed to reach the mouth. It is to be regretted that the photograph gives such an inadequate conception of this remarkable freak of nature.

On the evening of the 22d Mr. Kelly returned from across the bay and reported that he managed to cross the divide when he had good sunlight and could see the surrounding country well; that the distance from the cabin, or tide water, to the summit was about 7 miles; that there was no question but that a railroad could be constructed over it in its present condition, with very little labor, and that a pack or even a wagon trail could be easily made; that the descent to the Twenty-Mile River on the other side was very gradual and led down to a lake 4 miles distant and 5 or 6 miles in length; that he had traveled 26 miles from the seacoast and reached an elevated point from which he could see Turnagain Arm; that he also saw two divides or depressions in the range of mountains, through one or perhaps both of which he was satisfied he could find an outlet that would carry him to the Knik Arm, and possibly to Copper River. (Our information up to this point was that the Indians used a trail down some stream that brought them into the waters of Turnagain Arm from the Copper River, and we had been working on the assumption that this trail must pass down the Twenty-Mile River.)

On the other side of the divide he found an abundance of excellent cottonwood timber, that covered the country on both sides of the lake close down to the water's edge. The shores of this lake were somewhat abrupt, but not much trouble

would be experienced in constructing a trail or road on the slopes, which are gradual.

May 22 I first find mention of the mosquito pest in camp, and Mr. Kelly reported having been considerably annoyed by them. It is still too cold for their operations at night, but when the tent is warmed up they mysteriously but certainly make their appearance, and in sufficient numbers, even at this early date, to be regarded as an annoyance.

A rather sad and at the same time amusing incident that occurred to-day will serve to illustrate the manifold and various powers attributed to the commanding officer of the exploring expedition. I was called upon by one of the citizens encamped at the head of the bay and informed by him that I should come up to his camp at once. Upon asking why this step was necessary on my part, he said there was an old gentleman in his camp who was crazy, and that it was my duty to take him on board the *Valencia* when she arrived and carry him down to Sitka or some other point. An examination of this man, quietly instituted, resulted in establishing the fact that the old gentleman in question manifested his insanity solely by expressing an intention to remain at the head of Portage Bay after the others had left. No amount of explanation or argument would convince this man that I was not invested with powers to then and there, on this amount of evidence, appoint a commission of lunacy, authorize it to declare the man insane and send him, as suggested, to Sitka. My refusal to do so gained for me the permanent dislike and hatred of the applicant.

I will add here that the mere fact that this expedition was known to have been supplied with a certain amount of stores for the relief of distressed miners was a constant source of annoyance during the entire expedition, as a great many people believed, or professed to believe, that it was our duty to prevent them from committing improvident acts of all kinds, or, in other words, that we were to assume governmental powers of a most parental and charitable nature wherever we might be.

On May 23 we were visited by an Indian and his two sons, who came up from Mr. Kelly's camp, on the other side of the bay. He had been induced to go to that place by signal smoke that Mr. Kelly had made use of the day before as an experiment to ascertain whether the Alaskan Indians made use of

such signals for communication with each other. These smoke signals correspond to those used by the North American Indians in the States, and with which Mr. Kelly was thoroughly familiar from previous experience. It is used on some high point by igniting dry grass, which is allowed to burn for a few minutes, when wet grass is thrown upon it to dampen it. The effect of this is to create a puff of smoke, which rises high into the Heavens and is visible for a long distance. In this instance the throwing of the wet grass was repeated twice.

The younger son of this Indian, a lad of 12 years, had been to school at Sitka and could talk a little English. But he had been sent home on account of sickness, having inherited the disease so prevalent among the Indians.

I had just crawled into my sleeping bag when I was aroused by the whistle of a steamer down the bay, which proved to be the *Wolcott*, from Port Valdez. Going aboard, we found she had been sent over by Captain Humphrey, of the *Valencia*, to bring mail for the command, and to request that I should meet him at McLeod's Bay, in Montague Island, upon his return from Cooks Inlet, when he would arrange with me for transporting my command to our permanent base in Cooks Inlet. Careful examination of the mail showed there was nothing official from headquarters of the Department of the Columbia, and absolutely no mention therein of pack animals having been sent me as requested. The failure to receive these animals, or an indication that they would be furnished, was a sore disappointment to every member of the command, since it meant another month at least of weary waiting for the transportation absolutely necessary to pursue the work expected of us in Alaska. That no authority was granted for returning to the United States to participate in the war with Spain, in which our regiments were engaged, augmented very much this universal feeling of despondency.

The captain of the *Wolcott* very kindly lay at anchor all night, so that the members of the command and civilians located there could have time to answer their mail.

The following morning, accompanied by Capt. and Asst. Surg. J. S. Kulp and Captain Abercrombie, commanding officer of Expedition No. 2, who had decided to go to Seattle on board the *Valencia* in order to procure the necessary stock for our exploring work, I started for Resurrection Bay, where

this steamer was to discharge some passengers bound for the interior of Kenai Peninsula.

Stormy weather compelled us to lie to in McLeods Bay until the morning of the 25th, when we again put to sea and arrived at our destination the same date. Resurrection Bay is about 10 or 15 miles in length, surrounded, like all other parts of that country, by bold, precipitous, snow-capped mountains. At its head is located the half-breed family of an Englishman, who had deserted them a short time previously. The house in which this family lived was by far the most commodious, best constructed, and cleanest of any occupied by natives that I saw during my visit to Alaska. As they raised chickens, we were fortunate in securing two dozen eggs, which were collected for us from nests in the grass growing around the house. From two or three small gardens this family raised all the vegetables they could use.

Again referring to the passengers who were on board the *Wolcott*, I found that they belonged to the "Alaska Gold Mining Syndicate Company," of San Francisco, who had brought with them all the piping and machinery necessary for the establishment of a hydraulic plant near Lake Kenai. They purposed and were actually engaged in constructing a wagon road from the head of Resurrection Bay to their claims, a distance of about 60 miles, over which to transport their freight.

Lying at anchor in this bay was a schooner belonging to a syndicate who were prospecting the river that puts into the head of the bay. Up to this time they had found nothing they considered of sufficient promise to warrant their remaining.

On May 26 we again steamed for Montague Island, where we arrived about 4 p. m., in a rain storm. By attaching a fishhook to our lead line, we were soon supplied with all the codfish the passengers and crew could eat.

We had scarcely finished our breakfast on May 27 when the man on watch sighted the *Valencia* a short distance from us, in the open sea. She very soon cast anchor in the bay, when we boarded her to find Lieutenant Castner, who had been very sick from the effects of a severe cold and sore throat. Having ascertained from consultation with Captain Humphrey of the *Valencia* that he had received no requests

for transportation of stock of any kind to us, I thereupon determined to send Assistant Surgeon Kulp to Seattle with dispatches representing the absolute necessity for stock, if the expedition was to accomplish anything, and in case it was impossible to secure them, then, as an alternative, that the expedition be allowed to return for service in the war with Spain, caching the stores in some convenient place until the following season. I sent the surgeon because I did not feel warranted in going myself, as the command was badly scattered at this time, and then, too, I felt that no one else in the command understood the work contemplated so well as myself. In addition, I believed that if I remained I could acquire some valuable information by means of short explorations around the head of Cooks Inlet.

In the evening the two ships steamed out of the bay, one for the Orca cannery, the other for San Francisco. The *Wolcott* having steamed all night, we arrived at our destination in time for breakfast the following morning. It was during my stay here on this occasion that I enjoyed some genuine cow's milk and cream, from a cow that was brought up and kept at this place by the company. I also relished for the first time eating from a can which had just been packed some of the famous "king" salmon, which is indeed the king of salmon, not only on account of its size and beauty, but also from its very delicate flavor.

It was while waiting here at this time that one of the vessels of the company came in having on board 23,000 fish, which represented one day's catch by the fishermen at the mouth of the Copper River. This number of fish, though not the usual catch, was not unprecedented or even the largest made, but was enough to keep the cannery running continuously for three days.

The *Wolcott* having discharged her cargo, we left in the early evening for Portage Bay, where we arrived on the following morning. During my absence a cabin had been constructed on the other side of the bay and the designated detachment had transferred their effects and rations to it. The freight and passengers were soon on board, when we sailed for Cooks Inlet.

We arrived at Resurrection Bay on May 30, and discharged the passengers for that place, including Lieutenant Learnard and Messrs. Mendenhall and Bagg of the command, whom I

had selected to go across the peninsula to Sunrise City. Each of them carried in his pack ten days' rations and his sleeping bag.

We sailed out of the bay about 6 p. m., and about 11 o'clock the same evening we passed what is known as the Seal Rocks, because formerly seal and now sea lion are found lying on them at all times. These seal rocks consist of several immense bowlders that project from the water to an altitude of at least 100 feet. The moonlight view of these animals tumbling into the water from the apparently perpendicular sides of the rock amply repaid one for sitting up until after midnight to see it.

We rounded Cape Elizabeth in the early morning of May 31, and consumed the remainder of the day and until nearly midnight in reaching Tyoonok, at which place we found scattered along the beach from 200 to 500 prospectors, about 100 Indians (men, women, and children), and the trading station of the Alaska Commercial Company.

This place is generally considered to be the head of navigation in Cooks Inlet, but I subsequently ascertained that excellent anchorage, plenty of water, and a safe harbor were obtainable at Fire Island, which is situated between the mouths of Turnagain Arm and Knik Inlet, a distance of about 18 miles farther up the inlet.

In passing up the inlet proper I found, much to my regret, that the distance from shore to shore was too great to enable us to sketch in, with any accuracy, the formation of it.

The first and most gratifying sight that met our eyes on the following morning was some pack animals (one horse and four mules), in charge of Sergt. Wm. Yanert, for duty with the expedition. With him were encamped Corporal Young and party.

After examining this place I determined to place the command in camp at Ladds Station, located 5 miles farther up the inlet, about 2 miles above the North Foreland, and at the mouth of the Sushitna River. At this point we were entirely separated from and would not be brought into daily contact with the large number of miners, prospectors, and Indians then located at Tyoonok.

We used the *Perry* as a lighter. I finished my correspondence and discharged the cargo about the middle of the afternoon. By hard work of all hands until midnight we succeeded in pitching enough canvas to shelter the command.

The stock I caused to be brought up the beach at low tide, at which time the Sushitna River is easily forded at its mouth, where it breaks up into several small, shallow channels. At high tide this stream carries enough water to float steamers like the *Perry*, which is convenient for loading or unloading stock.

The water used here is taken from a shallow well, dug by Mr. Ladd at a very short distance from the beach. It is a soft and apparently satisfactory water for all camping purposes, but its purity is not improved by the use of the Indians located at that place.

On this date (June 1), having discharged Guide Howe, I secured as guide Mr. H. H. Hicks, who had been for three years prospecting up the Matanuska River, with which country and the Indians located on or near the same he was very familiar, having traded with them during his entire residence in Alaska.

Located at this place were Mr. Ladd's storehouses and about half a dozen Indian huts, containing as many families. These Indians were as shiftless and filthy as any I saw on the coast of Alaska. Among them was an Indian and his squaw from the Sushitna Station, about 20 miles up from the mouth of the river of that name, who possessed not only a Jewish cast of countenance, but a history that is quite revolting. In brief, the facts are that some two years previous to this he had asked one of the chiefs at his home for his daughter. The girl was at the time locked up in a bannya belonging to her father. This on account of an absurd custom—much less prevalent now than formerly—which requires that at the time a young girl first buds into womanhood she must not be seen by any male member of the tribe. The fact of looking upon a girl at this time, according to their belief, causes all sorts of ill luck and misfortunes to befall the unfortunate individual. If she looks at his gun, it would refuse to discharge, or else it would fail to kill the game at which it is aimed; or if at an arrow, it would break or go wide of the object; if at an ax, the edge of it would turn, etc. To avoid such dire results the unfortunate girl is locked up. She can procure food only after dark, and when the men have retired, which means that she practically gets nothing to eat during the period of her concealment, about six weeks. This fiend incarnate being refused permission to see the girl, as above

stated, set fire to the bannya in which she was located, and before she could be removed she was burned up. Not satisfied with this, a very short time afterwards he stole the wife of another member of the same tribe and made good his escape into the Kuskokvim country, from which country he reached Ladds Station the day before we arrived there.

Although this custom of confining these helpless young girls is frowned down upon and every effort made by the white element in that country to break it up, it is still secretly practiced by some of the Indians.

There was a young girl at Ladds Station who had been forced to lie in concealment under a most filthy bed, on the bare ground, for nearly a month before the matter was brought to my attention. I immediately caused her to be removed; and to insure that she should have proper food and attention in her then critical condition—she was reduced to practically skin and bone, although a plump, healthy child when incarcerated—I had her brought to meals with my own detachment.

This custom, although universal as to the young girls, was not confined to them, as many Indians compel their wives to conceal themselves regularly.

Three miles back from camp is a lake with a small outlet flowing into the Sushitna River. This stream was full of trout that will not rise to artificial bait, but will take live bait or salmon roe eagerly. With the latter I caught over thirty in a few minutes, and could easily have filled a couple of baskets had not our dog suddenly made away with it. This failure to get trout to rise to artificial flies followed us throughout our stay in Alaska. In one or two streams in the interior we caught a few messes of grayling. But it is safe to state that one who wishes to be successful at fishing must be provided with other bait than artificial flies.

The five animals sent me having had sufficient rest, and believing, from the best information obtainable, that an outlet into the interior could be found via the Matanuska River, I decided to send Lieut. J. C. Castner, U. S. A., with Mr. Hicks as guide and a sufficient number of enlisted men, up this stream for the purpose of cutting a trail as far as practicable before the mules needed and called for arrived.

Rations for this party for thirty days were packed and arrangements made with the *Perry* for transporting them

across to the Knik Arm. In the late afternoon this steamer anchored in the Sushitna River so as to load the stock. Shortly after this a heavy windstorm came up and prevented the party and freight from going on board for nearly three days.

During this storm the tide raised to a much greater height than at any previous time, caught the steel boat belonging to the command and carried it out to sea, notwithstanding the fact that the boat itself was pulled farther up on shore than usual and was made fast by means of the painter with more than usual care. It was not until some days after this that one section, the middle, was washed ashore at Tyoonok. This particular section was so battered and warped out of shape as to be worthless.

On June 5 Sergt. Wm. Yanert, whom I had sent on an exploring trip up as far as the Beluga River the day before, with instructions to find, if possible, a practicable crossing of that stream, returned and reported that he had been unsuccessful, and that the trail followed carried him into quite an extensive marsh, whereupon he went down to the seashore, which he found but little, if any, better. He managed to reach the Beluga, however, but it was too deep to wade at the existing stage of the tide, though it could be crossed by stock at extremely low tide without risk. He reported also that by going back from the shore the trail would follow high ground, so that if a suitable crossing to this stream could be found, but little, if any, trouble would be experienced in getting from this crossing to the Sushitna Station, as the intervening country consisted of low, rolling hills. He also reported crossing three creeks that empty into the main inlet between this camp and the Beluga River; that all of these streams run through a clay soil and would be troublesome to cross with stock, as they are quite deep and the banks steep.

On June 6, at about half flood in the afternoon, the stock, goods, etc., of the Castner party were taken on board, when we steamed to Tyoonok, and cast anchor to await the turn of the tide. While lying at anchor, and until we arrived opposite Fire Island the following morning, the vessel rolled and pitched so badly that our stock were constantly and violently thrown upon the deck.

We reached Knik Inlet finally, cast anchor, and waited for the vessel to go aground before attempting to unload. We

were deeply impressed with the appearance of everything in this inlet. The weather was much more mild than in the lower part of the inlet and the season more advanced than at Tyoonok or at Ladds Station by at least three weeks. The trees were in almost full leaf and the grass, a sort of jointed grass resembling the famous blue grass of Kentucky, was abundant and at least a foot high. The length of this arm is about 25 miles. Coming in at the head of it were the Matanuska and Knik rivers, the former from the east, the latter from the south. The valley there is quite flat and about 20 miles across. In fact, the valleys of both streams are in full view from just above the trading station.

This inlet, when the tide goes out, seems to be an immense mud flat. I learned from reliable sources that about two years ago the navigable channel of this inlet passed directly in front of and close to the trading station. But it seems that at that time an immense body of water came down, apparently from the Knik River, destroying not only the trading establishment of the Alaska Commercial Company, located on the opposite bank of the inlet, but also a number of Indian houses. The Indians say that as this flood came down it presented a solid wall of water at least 100 feet high. This statement, however, should be very much discounted. At any rate, the effect, in addition to the destruction of the houses, was to leave deposited in front of the present trading company's establishment an immense amount of mud and sand that extends out from the shore for nearly if not quite half a mile and prevented us from landing at the station. We were forced to cast anchor at the mouth of the small stream, 2 miles below, that is used by the Knik Indians during the season for fishing purposes.

The trees of this side of the inlet are principally alder and underbrush, though a short distance back into the interior there seems to be quite an amount of good timber.

I started late in the evening for my own camp, where I arrived the following morning, June 8, about 5 a. m. That night, accompanied by Sergeant Yanert and Private Marr, I sailed for Sunrise, where we arrived at 8 a. m. the following morning. On our arrival we found that Lieutenant Learnard and party had crossed from Resurrection Bay to Sunrise City on the 4th instant, accomplishing the journey in five days. They were very fortunate, however, in that they managed to

secure passage across Kenai Lake, 30 miles, in a sailboat belonging to the mining company. They had taken passage on the Steamer *Kodat* the night before and passed us as we came up.

I expected to meet also the party of enlisted men left at Portage Bay to assist Messrs. Kelly and Lampe, but hearing nothing of them, I left instructions with the agent of the Alaska Commercial Company to see that they were properly provided with necessaries when they arrived at Sunrise, and with transportation to Ladds Station.

On this occasion I made diligent inquiry as to the possibility of finding a practicable trail from the head of Turnagain Arm down the arm itself to the mouth of Bird Creek. The result of it was that a practicable road was possible, but considerable difficulty would be encountered both winter and summer—during the latter season by reason of the high water, and during the former on account of snowslides, which were frequent at certain points along this trail.

To sum up the result of our work to the present time in finding a trail from tide water, I find we have discovered a practicable route from both Portage Bay and Resurrection Bay, which are excellent harbors, open all the year around, to the head of Turnagain Arm and to Sunrise City. It only remained, therefore, to connect these trails with the Knik Arm, from which point, from information received, we will find a good outlet to the interior.

There is no question as to the value of the trail between Resurrection Bay and Sunrise City, as it is certain to be used by the people of Sunrise during the summer season. I subsequently learned that this trail was very generally used during all last summer by prospectors who were at work in the Kenai Peninsula.

Having started Sergeant Yanert across the arm and instructed him to go up Indian Creek, over the divide, and down the Perry River, I started for the permanent camp, which I reached the following morning, June 10, 1898.

I learned from Lieutenant Learnard's party that they had succeeded in finding a practicable trail across Kenai Peninsula, and experienced but little, if any, difficulty in making the journey, except the disagreeable and unpleasant duty of wading streams, in which there was floating ice, up to their waists; but for this they were somewhat compensated by

their success in killing a moose calf and a very large brown bear. In the leg of the bear they found a leaden bullet that evidently had been there for a long time.

This (June 10) was a very still, hot day—one of the hottest we experienced during the season—and we were bothered by immense swarms of mosquitoes.

JUNE 11.—I learned that a stern-wheel boat was being constructed at Tyoonok for the purpose of plying up the Sushitna River. As Lieutenant Learnard and party had recovered from their trip across the peninsula, and were anxious to start on their proposed trip up the Sushitna River, we went down to Tyoonok to examine the boat and look into the question of transportation generally.

I soon learned that the stern-wheel boat was being constructed by the owner for his own use, and that he had already promised to take one or two of his friends with him up the river, his intention being to use his boat at any and all points where the soil or sand indicated that they could get gold in paying quantities, either by dredging or by means of sluice boxes; so it would be of no value to me.

On Sunday, June 12, I met a representative—Mr. O. O. Sleeper—of the company that is setting up a hydraulic plant on the beach about a mile below the Sushitna River. He told me that this company was formed in the East for the purpose of working quite a number of claims that had been located at that point. At this time they had just about completed a ditch from the beach back to the lake, a short distance only, and, the pipes being practically set, they were ready to commence work. When they started to work their intention was to run about 240 hours, when they would have a "clean-up." It seems a preliminary examination of these claims showed they could reasonably expect the soil to yield $3 of gold per cubic yard. A subsequent practical test, however, revealed the fact that after running for ten days they saved not to exceed 10 cents, necessitating the absolute abandonment of the plant, that must have cost the company about $40,000.

I think it but fair to state that prospectors and miners of that country at no time believed that these particular claims would pay anything; or, in a word, they believed the result would be just what it turned out to be; and I feel sure that I voice the sentiments of the responsible people of that section

when I state that they, more than anyone else, regret the effect upon Alaska of this class of experiments.

Members of the command had learned by this time how to set the king-salmon net which had been loaned us, and succeeded not only in catching all the fish that could be used by everyone located at Ladds Station, but we were forced to make "eukla," and subsequently we salted a number of barrels. The command, notwithstanding the fact that we used the fish at least for one or two meals each day, managed to eat it with relish. A number of them told me that they had never before been able to eat the salmon of the Columbia River, and were much surprised that they could eat salmon at all.

At this season, too, the famous "candle" fish puts in its appearance in immense numbers. So thick, indeed, are their schools that with every outgoing tide one finds them cast upon the beach, unable to get back into the water, rendering it an easy matter to gather up a water bucket full in five or ten minutes, selecting only those that are alive. They are so thick, in fact, that the squaws, when enterprising enough, can catch great quantities by dipping an ordinary basket into the water. These fish are very much like ordinary smelt in texture and flavor, although two or three times as large and very much more oily. It is said that this fish derives its name, "candle" fish, from the fact that when dried it will light and burn like an ordinary candle.

On June 13 Private Jones and party of three enlisted men arrived, on board the schooner *F. F. Finney*, from Sunrise City. He reported that in coming across from Portage Bay he experienced but little difficulty until he had crossed Lake Glenn. At the mouth of this lake the Twenty-Mile River starts. This river he found to be quite a large-sized stream. He expected to go down it on his raft, but had not proceeded a mile when he discovered some rapids too dangerous to shoot, because there was a fall of about 25 feet in the first 200 yards that was full of rocks or bowlders, and farther down another fall of 20 or 25 degrees. The entire length of these rapids was 1 mile. He was forced to abandon his raft to travel on shore.

From this point to Spruce Camp, on the Turnagain Arm, he estimated to be about 18 miles by the winter trail. This trail he was unable to follow, however, as the snow had disappeared, and instead made a long detour of 30 miles in order

to avoid impassable swamps that intervened on the regular trail. Some swamps, in which he found water and mud up to his waist, he was compelled to cross, and there the mosquitoes were exceedingly troublesome. On account of these swamps and mosquitoes his party was compelled to travel night and day, without sleep, for four days, or until they reached Spruce Camp. Notwithstanding this long strain and constant harassing fight with the mosquitoes, he reported that his party performed its work cheerfully.

The valley of the Twenty-Mile River is from 2 to 5 miles wide, terminating in precipitous mountains on each side. This river forks near the headwaters on the farther side of the lake, but the main stream runs through Lake Glenn. A railroad could be easily constructed up this river with no danger of snowslides, but it will be necessary to trestle or bridge some of the swamps.

On June 15 I received mail from Tyoonok containing news from Vancouver Barracks up to the 27th of May and papers up to the 1st instant. I also received from the manager of the Boston Mining Company, located at Tyoonok, information that he would charter his boat for service up the Sushitna River at the rate of $75 per day. Upon investigation I found that it was a screw propeller with a speed of about 8 knots. Her capacity for freight was limited to about 2 tons, but in reality would fall short of that amount. In addition she could carry six persons, including the crew.

A report from Lieutenant Castner received on the 16th instant informed me that his command was having a very rough experience, and especially suffering from the mosquito pest. They were amply provided with head nets and gloves, but it was necessary to eat and drink, and when engaged in this time enough was allowed these insects to make red bracelets around their wrists and necks. The tents (conical wall) furnished him were entirely unsuitable as a protection from mosquitoes, as they were open at the top to permit the passage of a stovepipe, and this opening furnished more than sufficient space for admission of mosquitoes by the million.

It is light enough to read a newspaper at midnight, the darkest hour of the day.

On the 17th instant I received word from the agent of the Alaska Commercial Company at Tyoonok that I could secure the services of the Columbia River boat belonging to the

company, and also the services of her master, for carrying a party up the Sushitna River. The price quoted was such that on the following day I made arrangements with him for the use of it. I also received a report from Sergeant Yanert stating that he had been unable, on account of shortage of provisions, to go across from Turnagain Arm to Knik Station via Indian Creek, as contemplated in his instructions. He had succeeded in making his way up Indian Creek and crossed the divide, but, having consumed much more time than anticipated in making the distance, decided to return. He encountered no obstacle, except shortage of provisions, to prevent his getting through at this point. A good trail can be found over this route; but subsequent events, as will be seen, show that it is not of special value. (See map.)

On the afternoon of the 19th Messrs. Kelly and Lampe returned. The former reported he had been forced to put into Sunrise on account of shortage of provisions, as set forth in his report. He also mentioned discovering what he described as a "glacial lake," the location of which corresponds so accurately to the description of that at the head of Knik River it must be the same. Mr. Kelly described it as being about 8 miles in diameter, at or near the sea level, and that it was full of ice. A little open water and an apparently contracted outlet appeared toward the northwest portion of it, which was evidently the head of the Knik.

Lieutenant Learnard and party were ready to sail at 2 p. m., but had scarcely gotten under way when they were forced to round to on account of striking a rock, which broke the rudder. This was repaired, and they started again the following morning about 2 o'clock.

JUNE 21.—I sent Messrs. Mendenhall and Kelly across to Sunrise, provided with ten days' rations and instructions to proceed from that point, at which the latter had abandoned his trail, to the Knik Arm. The result of this appears in Mr. Kelly's report.

On this date over one hundred prospectors, who had never left the beach since landing at Tyoonok, took passage for the States, each and all of them denouncing Alaska.

In the evening of the 28th the steam launch of the Boston Mining Company came up, and about midnight was loaded with freight for use of the detachment sent up the Sushitna River. We were to start early on the following morning, but

a storm came up and forced the launch to run back to Tyoonok. This was fortunate, since, on the following day, I received a communication from Lieutenant Castner stating that from the best information obtainable it would be impossible for him to communicate with Lieutenant Learnard for supplies on the Talkeetno River via Chicaloon River, as had been contemplated by me when formulating my instructions to them. At that time Vasili's cabin, on the Talkeetno River, was to have been the base of supplies for both of them. This was because supplies could be shipped by water on steamers quite near to that point, according to the best information.

Although I had informed Lieutenant Learnard that I would follow him up the Sushitna River, fully expecting to overtake him somewhere near the station, I felt that I must communicate with Lieutenant Castner in person, if possible, before sending any further supplies to Lieutenant Learnard, particularly as he had enough with him to last at least two months. I immediately advised Colonel Maher, the manager of the launch, of the enforced change in my plans and requested that the supplies be returned.

To reach Lieutenant Castner necessitated a trip to Knik Inlet, so arrangements were at once made with Mr. Ladd for the use of his launch. After loading and unloading our freight three times, and repairing the launch ourselves, we managed to get started two days after the date agreed upon. This journey was the worst and most disastrous undertaken by any party. In the first place, all of our stores were saturated with salt water, due to handling in rough weather. Nearly all of our sugar, over 200 pounds, was lost, and all that we saved was so full of salt as to be of little use. We lost some of everything, in fact, that was subject to damage by salt water, such as tea, flour, etc.

Again we should have arrived at our destination on one tide, but were delayed, without sufficient reason or excuse. The result was we were compelled to anchor at the mouth of the inlet until the tide turned about midnight. We were unable to get any rest, as there was no place to locate our sleeping bags.

We had gone but a short distance the following morning when we were caught in some tide rips that came very near swamping us. When we escaped it was discovered that we were on the wrong side of the inlet. In trying to reach the

opposite shore we were caught on the point of a sand bar and forced to cast anchor to prevent being again swamped. The anchor rope was not made fast to the boat, but by rare good fortune and coolness on the part of Private Blitch, the bight was caught and securely fastened. As soon as the boat received the full force of the current, which is stronger and has a greater velocity than any in Cooks Inlet except that of Turnagain Arm, it was evident that the anchor rope was not strong enough to hold the boat. So great was the force of this current that the bow of the boat was thrown completely under the water, deluging the men located there. In his excitement Mr. Ladd seized an axe and tried to cut this rope, but Private Blitch again displayed his coolness and good judgment by throwing himself across it, thereby preventing the probable destruction of all on board.

I then gave orders to the engineer to steam against this current in order to reduce the strain on the rope. After about two hours, the tide being nearly at full flood, the current was sufficiently reduced to permit our making headway against it when we lifted the anchor, and in a short time landed ourselves and the freight at the station.

This was the glorious Fourth of July, and was spent in regaining the necessary sleep we had lost and in fighting mosquitoes, drying our clothing, and loading our freight on the Columbia River boat, which I had engaged to take it up to Melishe's cabin. From this point I dispatched a messenger to Lieutenant Castner on the following day, July 5.

The following six days were the most miserable of all we spent in Alaska. In this cabin, which was dark, damp, and gloomy, entirely surrounded by a dense growth of underbrush, quite as high as the cabin itself, millions upon millions of mosquitoes swarmed. The cabin was too open to shut them out, and our only relief from them was to make a dense smudge of "Indian tobacco." Living in such an atmosphere for twenty-four hours of each day was almost though not quite so bad as the mosquitoes themselves. I ascertained afterwards that one of the best and simplest preventives against mosquitoes, if one is provided with a closed tent of some kind, is to take buhac, or ordinary Persian insect powder, and burn about a teaspoonful of it in the tent. This is inexpensive and kills all those that it reaches. The fumes of it are neither dangerous nor so disagreeable as those from the

tobacco smoke. The latter makes people unaccustomed to it deathly sick.

Having heard from Lieutenant Castner on the 9th instant, I again sailed for my permanent camp at Ladds Station, where I arrived on the 13th, to find that the mail boat had come in from Seattle, but had brought no transportation of any kind for my command. The mail had been sent to meet me at Knik Arm, but unfortunately passed me en route. After waiting in camp for a couple of days this mail returned, and I was informed therein that no transportation had been secured for my command, and that it was questionable whether I could use pack animals at all, and that the 5 animals already furnished, together with the portable steel boat, already spoken of as having been lost, must answer the purposes of the command. I learned, however, this time, that the commanding officer of Expedition No. 2 had purchased and brought up on this same boat 40 pack animals in addition to the 5 originally sent him. I could not understand why Expedition No. 3, which was larger and had a larger field of operations, should be reduced to 5 animals, or one-ninth the number furnished Expedition No. 2.

By inquiry I learned that at Sunrise City there were more pack animals than the owners would care to winter, and that all I needed of this stock could be purchased for much less than it would cost to ship them from Seattle.

On the 17th day of July, knowing positively that I could secure the stock without delay, I loaded all necessary rations and men aboard the *Perry*, and about 10.30 p. m. sailed for Sunrise City, arriving the following morning. On that and the following day I secured 25 head of horses and mules, and by the evening of the 20th had loaded them on board and was ready to sail for Knik Station, where we arrived at daylight the following morning.

To avoid crossing a couple of boggy streams between the fishing village and the Knik Station, we induced the *Perry* to land just above the station, where, by going through a narrow channel, a good landing could be made and the stock could be brought ashore with safety and ease.

To avoid any possible danger in getting ashore at this point, where the waters were unknown to the pilot of the boat, I went up to the station, secured a pilot, and was just rowing out with him to meet the *Perry* when the pilot, either through a

misunderstanding or some other cause unknown to us, and notwithstanding the fact that a flag had been placed on the sand bar to indicate the location of the channel, managed to run the bow of his boat onto the sand bar, whose banks were almost perpendicular at that point. He did not seem to realize or appreciate what he had done, as he continued to go ahead with full steam until the greater portion of the boat was hard aground on this bar, too hard, in fact, to shove or pull her off. Our situation was most critical. The tide had just commenced to ebb, and should we leave our stock and freight on board it was a foregone conclusion that the boat itself would be lost, as she was not strong enough to carry the weight on board of her when the tide ran out. It was necessary, therefore, to unload the stock at once. This meant a probable loss of all of them, as this bar was practically a mud bank, on which they would surely bog. Fortune seemed to favor us, however, on this point, for we found by spreading hay on the surface we could prevent their bogging at the point of landing. We were nearly half a mile from shore, however, with a channel intervening, to cross which we would have to swim the stock unless we waited until the water had completely run out. I decided upon the latter alternative, and tested the intervening space as much as possible in hopes I would find some place without quicksand, but without success. In sheer desperation I finally selected one horse that I would sacrifice if necessary, and started him across. Much to my surprise he reached the shore safely. We then tried to send across one at a time, but had succeeded in only starting a couple when the herd broke away from us and started pellmell for the shore, which they reached in safety. We learned then that the stock could be useful in soft ground, and subsequent experience corroborated this.

In the meantime some of our goods had been transferred from the *Perry* to a Columbia River boat. The remainder we were forced to carry by hand across the quicksand. The fate of the *Perry* hung in the balance until the tide came in, which, by good fortune, was somewhat higher than that of the morning, and high enough to float her, so that she escaped without serious injury.

By evening we succeeded in getting packs adjusted on all the animals and started them up to Melishe's cabin, where they arrived about 2 a. m.

I personally devoted my time to securing the services of an Indian to accompany me as guide, a rather difficult undertaking, that required considerable pressure being brought to bear by the agent of the North American Commercial Company. The average Indian at this season of the year is amply supplied with excuses for failing to do work of any kind. He has either a sick child or a sick relative of some sort, but the real reason for refusing is that at this season of the year he is catching fish in abundance, which supplies him with all the food he can eat, and an Alaskan Indian with a full stomach is too indolent to perform work of any sort. I finally succeeded in securing one, however, known as "Big Stephan," with promise of another, who was absent at the time, but who was to be sent to report to me on the trail. The latter I intended for service with the detachment to be sent up the Chicaloon River and across to Vasili's cabin, on the Talkutuo, to communicate with Lieutenant Learnard.

All of the 22d was consumed in adjusting packs, fitting pack saddles to the animals, and, generally speaking, getting ready for the start on the following morning. In so far as practicable I placed all smaller articles, such as coffee, matches, etc., in sacks weighing from 30 to 50 pounds, to be used as top packs for the heavier articles placed in the kyaks. Each animal was loaded with at least 225 pounds. A few, however, carried packs weighing as much as 250 pounds. These amounts, after careful consideration of the trail over which we were to go, were all that it was deemed advisable to place upon animals unaccustomed to work on grass only.

On July 23 we managed to get started about the middle of the forenoon, and arrived at the "Waterhole," our first camp, about 11 miles distant, at 6 p. m. We procured water for camp purposes from a small spring in the side of the bluff on which we camped, and for the stock from a small creek that runs along through the bottom. The grass in this bottom was most luxuriant, and we attempted to hold the stock down in it, but the mosquitoes were so thick it was impossible to do so. We finally permitted them to come up on the bluff where we were, but where the grass growing in the timber was somewhat scarce.

All of July 24 was consumed in bringing the stock back from Melishe's cabin. The trail up to this point practically follows the bluff or second bench we ascended immediately

after leaving Melishe's cabin, and runs through a wooded country all the way. Our only obstacle was a couple of small swamps that Lieutenant Castner had brushed up in a few places, and over which we passed with comparative ease.

JULY 25.—We traveled 12 miles and went into camp on what is known as Beaver Creek, having passed two or three small swamps and between two lakes, which we called Lucille and Finger lakes.

Here we met four enlisted men from Lieutenant Castner's command, ordered back to Melishe's cabin to report to me. They had with them one of the mules Lieutenant Castner had been using and that on the previous trip was abandoned. One look at him showed that to attempt to use him further for this work would be worse than folly. He was very thin, and his whole appearance indicated that but a spark of life remained in him. His entire back was covered with sores resulting from constant packing of miscellaneous articles on his aparejo.

Private Powers, of the Fourteenth Infantry, one of this detachment, was completely exhausted, due to constant hard work. His willingness to work and lack of judgment as to the amount of strain his system would stand had reduced him to a very unfortunate physical state. I found, upon examination, and from previous as well as subsequent knowledge of him, that he was an excellent man in every way. His main, if not his only, fault consisted in a too great willingness to perform not only his own share of work but that of other people. As I could spare no one to return to Melishe's cabin with him, and not caring to send him alone, I decided to carry him forward for a day or two.

The camp at Beaver Creek is located in a very dense woods, consisting of spruce, several varieties of cottonwood, and some alder. Along the banks of this small stream we found excellent grass for the stock and experienced practically no difficulty in holding them during the night.

JULY 26.—We traveled 10 miles to Tsadaka (Moose) Creek. The trail led through a very dry upland district, densely wooded, with only here and there patches of grass. The banks of Tsadaka Creek on either side are very steep. We experienced no difficulty in getting down to the creek itself, as a trail had been previously cut for use of Lieutenant Castner's pack animals. This, like all the other creeks that

we passed, is a mountain stream, but gave no special indication at the crossing of being of glacial origin.

JULY 27.—We crossed over quite a high divide which separates Tsadaka from Granite Creek, then followed up the Matanuska River, which we first saw from the summit, for about 3 miles, and found a very comfortable site for camp directly on its banks, with excellent grass close at hand. Up to this time we had had beautiful dry weather and experienced our first rain to-night.

JULY 28.—We were again unfortunate in having our stock stray back toward Tsadaka Creek last night, so that we did not get started until after noon. After traveling about 3 miles we came to what is known as King's cabin, which is situated at the mouth of the creek bearing his name, where we found a party of prospectors. These men had experienced untold hardships in bringing their supplies by boat up the Matanuska River, and were exceedingly anxious to purchase stock from me for going into the interior. All of them had very positive ideas that the only place for them on earth was the Tanana River. The operation of packing their stuff on their backs they discovered to be slow, tedious, and tiresome, as it required passing over the trail a number of times.

They informed me that King and Chicaloon creeks were very much swollen, but thought the former could be crossed with little or no trouble. In view of the high stage of the water, I determined to camp on this side of the crossing, so as to catch the creek at its lowest stage early the following morning.

We moved up this creek about 4 miles to the mouth of a small tributary known as Young Creek, where we found a cache made by Lieutenant Castner and party. It contained, besides the private effects of members of the command, one can of butter, which was a delicacy we very much appreciated.

JULY 29.—We were delayed in getting started on account of the rain that had been falling all night and which continued to favor us at intervals throughout the day. The atmosphere was very close, especially in the densely wooded valley up which we passed. Besides, the thick brush, having become saturated with water, thoroughly soaked us. In about two hours we arrived at the crossing, just below which King Creek is divided into two channels, over which foot logs had been placed. I had just crossed the first and swiftest branch

when I saw that the bell mare had fallen down in the stream, carrying Private Canwell, of the Hospital Corps, with her. He (Canwell) was making every effort to get her up, but the poor brute was so tender-footed—being unshod—that she was afraid to stand up on the sharp rocks forming the bed of this stream. The current was so swift that the water in striking completely submerged her. Even her head was under water for some time. This finally induced in her a feeble effort to rise, which, aided by the force of the current, resulted in her being rolled over and over until both horse and rider were swept into the swift, narrow, and very deep channel that I had just crossed. It was too swift for either of them to swim, but strong enough to float them down with great rapidity until the mare struck the two foot-logs, knocking them out of place. Private Canwell displayed rare presence of mind during all this time, making every effort to save the brute, and quitting his hold upon her bridle only when it was apparent that further effort on his part was useless. He was helped ashore by some of the men on the other side. In the meantime all of the mules of the train seemed to take in the situation and made the air hideous with their cries. Half a dozen of them, being in the water at the time, followed her down into this deep channel, and, not liking the situation, managed to swim ashore, when they joined the rest of the herd. All of them were running down the bank trying to outdo each other in expressing distress. Their voices were not musical, but their distress was genuine. In the meantime the bell mare rolled over and over down the stream, turned a sharp curve, and was lost to view. As her head had been under water practically half this time, I assumed of course that she was drowned, but on turning this curve she managed to float close enough to shore to permit the men to reach and pull her out.

I then utilized the horse train to carry the men across the stream. The bell mare was tailed to one of these and literally dragged across, with the mules following her. She could not be made to cross any other way, and the mules would not cross without her.

The loss of the foot-logs was a very serious one for the prospectors, so I decided to go into camp at this place in order to replace them and at the same time to permit the men to dry their clothing.

The bell mare's pack was a total loss. It consisted of 200 pounds of beans, which we afterwards felt the need of very much, besides a sweater, one pair of tarbesos, a camera tripod, and a notebook belonging to myself. The latter contained my diary, or daily notes, for more than a month, and its loss was more regretted than anything else, because it was impossible to replace it.

A fair idea of the swiftness of the current in King Creek is gained from the loss of this book. When it first dropped from the pack into the water it was seen and recognized by two of the command, who immediately started after it as fast as they could run down the bank. Although they chased it for some distance, it constantly and steadily gained on them until they were forced to give up the chase.

Just across this creek, on the side we had left, is quite a large mountain, consisting principally of rock, on the face of which are very large spots worn smooth by glacial action. Near the top of it two large black bear roamed in plain view nearly all the afternoon, paying no attention whatever to us or to our stock. The trees passed to-day were principally cottonwood.

JULY 30.—It rained on us during the night so that we could not get started until about 10 a. m. We immediately climbed a hill that required considerable work to get the train over. After traveling about 4 miles through heavy timber, we came to a small lake, and about 2 miles farther on was a small stream, a tributary of the Chicaloon Creek. About half a mile beyond this was another small stream. The Indians stated that this lake empties into the Matanuska River and not into the Chicaloon. Two miles farther on we struck another stream, unnamed, which is clearly a tributary of the Chicaloon, the crossing of which is only about a mile and a half from that stream. The crossing of the Chicaloon was 3 miles above the point where we first struck it. When we arrived at this crossing we found that although the stream had been very high the waters were subsiding, so that we could cross without difficulty the following morning. The march across from King Creek was especially fatiguing, as the weather was very close and the trail led through a dense forest. The footing was very fair, except alongside of the lake and for a short distance up the Chicaloon, where it was marshy. I had personally assisted in cutting the trails,

and not being accustomed to swinging an ax, found it very tiresome.

The stock seemed to feel this trip more than on any previous day. One of the mules succeeded in eluding the packers and concealed himself in some heavy brush during one of the short stops we made. We did not find it until the following day, when it was discovered lying down in the brush by one of the Indians, with 200 pounds of bacon still intact upon its back.

JULY 31.—As the grass at this point was not very abundant, I kept the stock tied up during the night, and sent them out to graze at daylight in the morning.

To-day the supplies were divided between my own detachment and that under Sergeant Mathys. The former was to accompany me to the interior via the head of the Matanuska, while the other was to go up the Chicaloon and thence over the divide to the Talkeetno. I ordered two men back from this point to Melishe's cabin, having them take one animal that was crippled, and instructed them to pick up the old mule we had abandoned at the lakes, as previously stated.

During the forenoon we succeeded in finding a crossing of the Chicaloon, which brought us out on the other side near the mouth of the little stream that we have called Schoonhoven Creek. This stream is very swift and full of bowlders, but we experienced no difficulty in crossing it. It is full of rainbow trout and some grayling, of which we caught a mess that evening. The panning of the gravel in this creek indicated a few colors to each pan, but it is not believed that the indications warrant further prospecting. It is worthy of remark, however, that the entire creek had been staked off into claims by the party of miners located at the mouth of King Creek. We went into camp on this creek to await the arrival of the bacon on the gray mule, also to give the stock a chance to fill up on the good grass so abundant on the first bench back from the creek. Although we had showers throughout the day and night, we managed to dry out our bedding, clothing, saddle blankets, etc.

AUGUST 1.—We got an early start because we had 4 miles of constant climbing ahead of us. After traveling about 6 miles, we came upon a shelter tent which we found occupied by Mr. Kelly. He had been left at this point by Lieutenant Castner, with instructions to wait for and report to me.

Aside from the climb above referred to the trail was in very good condition, especially after we reached the top of the hill, which brought us above timber line. Although Mr. Kelly was absent from his camp, he had left a note for me, and, more important still, the carcasses of two mountain sheep were hanging upon a rack. As the grass was good and the rain continued throughout the day, I decided to go into camp at this point. Speaking of sheep reminds me to say that from this time on until we arrived at Bubb River we were constantly in sight of herds of them running along the sides of the steep mountains to our right and left. Their trails usually ran alongside of perpendicular, rocky cliffs, and at all times near the summit. It was an easy matter to kill plenty of them at any time we saw fit to stop for twenty-four hours for that purpose. The most successful way to hunt them is for three or more people to go together, one or two to drive for the others, who station themselves at favorable points, taking advantage of the wind.

We found we had climbed 1,350 feet from the valley of the creek and that our total elevation at this point was 2,450 feet. We could have obtained at this height a fine view of the surrounding country but for the clouds that lay very low all day. They were, in fact, almost on a level with us. Mr. Kelly reported that Lieutenant Castner had left on the 25th ultimo, leaving no positive information as to where I could expect to meet him.

AUGUST 2.—We were again delayed on account of inability to find the horse train that apparently had strayed away. It was difficult to find them, as the alder grew so thick and so high that one could not see animals when within a few feet of them. Toward the latter part of the forenoon we found them, however, and proceeded to pack at once, so as to get started immediately after lunch.

The first 2 miles our way led through very deep moss, with no trail. Then we crossed a sort of hogback into a rather wide ravine, from which the waters flow toward Schoonhoven Creek. Our trail then carried us up close to the foothills, along which we traveled until we arrived at a small creek 7 miles from the former camp. Here we pitched our camp in a grove of quite large spruce timber, with excellent grass in abundance.

The view toward Knik from the top of the divide was one of the most superb we had seen. Nestling in the mountains

to our right, across the Matanuska River, could be seen a number of large glaciers. On the sides of the mountains we also saw immense masses of red flowers, covering large areas, and nestling in the mountains to the rear were three or four beautiful lakes, with Schoonhoven Creek in the distance.

We passed through a number of places to-day where the grass—redtop—grew as high as our waists. It was very nutritious at this season and ready to cut for hay. The stock filled up on it quickly. It rained during the entire night.

AUGUST 3.—The weather had cleared but the sky was not visible when we started in the morning. Our trail carried us through considerable moss, which was, as usual, deep and spongy. When this is frozen it will become too slippery to carry stock over. Should we not return before extreme cold weather sets in, our chances of losing all of our stock on this account are excellent. During the day we turned north out of the Matanuska Valley and up one of its tributaries, called Hicks Creek. At the junction of this valley we were forced to climb another mountain, 1,300 feet high, the other side of which terminated in a very deep gulch, through which flowed a small stream. In the bed of this stream we camped for the night.

The last 2 miles of the trail is not practicable for stock, as it is very steep and covered with moss. In coming down one of the mules slid down a rather steep incline for about 20 feet, and in doing so managed to carry the moss with her, thereby exposing to view a mass of blue ice, over which this moss had spread. Distance traveled, 10 miles. Although the mosquitoes were becoming less and less troublesome each day, we suffered considerable from them last night.

AUGUST 4.—It was refreshing to awake this morning to find the sun shining, though we had gotten but little rest on account of the exceedingly rocky surface upon which we were forced to lay our sleeping bags. The stock, although on good grass all night, showed every evidence of the effects of the cold raw wind and rain that favored us all night. In order to get out of this gulch we were forced to construct a trail up the steep bluff immediately after leaving camp. We then crossed a sort of divide to another creek, distant about a mile and a half, up the bed of which we traveled for about 3 miles, crossing the stream itself a number of times. At its head we found two small lakes, the waters of one emptying into the

Matanuska by the stream we came up, the other flowing in the opposite direction, emptying also into the Matanuska, but via Caribou Creek.

We followed down this latter creek for a mile and a half, when we found Lieutenant Castner's trail turned more to the north. As soon as our Indian Stephan discovered that we had turned to the north, following Lieutenant Castner's trail (I did this hoping to overtake him in a shorter time), he became very much upset and informed us that the Castner party would certainly have to return; that the country through which we were starting would be found impassable. We disregarded this, however, and pushed on until it became too dark to travel farther, when we went into camp on the side of a hill in very deep moss. As it continued to rain during the night, this proved to be one of the most uncomfortable camping places we found at any time during our trip. The water running through the moss soaked through the bottom of our tents and thoroughly soaked our sleeping bags, so that when we awoke in the morning we were as wet as if we had been actually rained on. Speaking of these tents reminds me to say that they were constructed of three half shelter tents sewed firmly together. In the front a piece of canvas was sewed, leaving a triangular opening at the top for ventilation. This opening we covered with bobbinet to keep out the mosquitoes. This tent was the most satisfactory for all purposes that we could devise, being of little weight, easily constructed from the material furnished us, and affording ample space for two men. The Indians used a tent of much lighter material, but it did not shed rain or water nearly so well. We traveled above timber line all day, with clear, crisp weather, just cool enough to make traveling comfortable. Had no trouble in securing enough scrub spruce for cooking. In passing Hicks Creek we left the moose country to our rear and passed into the caribou country, the signs of which were quite abundant. Reindeer moss abounds in all of the section traversed to-day.

AUGUST 5.—The country traveled to-day was very rough and mountainous, our average elevation being about 3,200 feet. After traveling about a mile and a half we found ourselves in a creek, up which we went for nearly a mile, then again climbed a high mountain, along the side and highest part of which we passed for about 2 miles, again coming down into a small creek. This was done to avoid passing through the

canyon at the mouth of it. We passed up this creek, known as "Billy" Creek, to its head, and went into camp on the summit, at an elevation of nearly 3,000 feet. We found grass on the trail in a few places, and in sufficient amount at the camp for the stock. That of to-day was a species of bunch grass that grew very scattered. The stock, however, seemed to relish it more than the redtop. We were forced to use dead willow for fuel. During the night the snow fell not 300 yards from us, rendering it chilly enough to make us hug our sleeping bags very closely.

AUGUST 6.—We were treated to showers of rain throughout the day. Our trail carried us over a steep hill, or divide, that we experienced considerable difficulty in climbing. We then crossed a divide into another creek that we followed for about half a mile, then crossed another to the head of a small creek that evidently flows toward the Copper River. In this last-mentioned creek we found drift coal, the best quality of any thus far seen. About 2 miles below our first crossing we went into camp. It was impracticable to travel down the bed of this creek, so we followed along the foothills, going close up to them at times in order to avoid some deep canyons. This entire country abounds in reindeer moss and caribou signs.

Our Indian informs us that we are four sleeps—this means five days' travel—from the lake, for which Lieutenant Castner is evidently making and where he expects to secure Indian guides to conduct him to the Tanana. We have passed through the coast range and find the average temperature somewhat higher than on or near the coast.

The country traversed to-day is certainly not suitable for a trail, though the highest divide crossed was about 5,000 feet high.

AUGUST 7.—The weather continues cloudy, with rain at frequent intervals. We followed down Bubb (Taiklano) River to a tributary of the same coming in from our left, and which the Indians call the "Taikano," where we met Corporal Young and Mr. Hicks, who formed part of Lieutenant Castner's command and had returned from the lakes that day. They brought letters for me from Castner. We found the Taiklano (Bubb) River and tributaries full of trout and grayling. Both are very wary of rising to a fly, but take caterpillar or similar bait with avidity.

Our trail led directly down the creek, which we waded at average intervals of about 100 yards throughout the day.

Soon after meeting the two men mentioned above we decided to go into camp, because I intended to take them with me and they were both very tired and footsore, being practically barefooted. Again we were forced to use dead willow for firewood. The bunch grass spoken of yesterday continued to be sufficient for our stock.

From Mr. Hicks I learned that the Indians at the lake spoke of a party of seven men who were coming up the Taxlena River. We inferred that this party was a portion of Expedition No. 2, since the Indians spoke of one of them as being a "tyone" (chief) with fine clothes on, evidently referring to a uniform.

Constant wading in water above one's knees, especially when one's shoes do not leak, is maddening. With each step the water rushes back and forth to a new place on one's foot, carrying the coarse gravel with it to a new and tender spot. To avoid this I cut holes in each shoe to let the water escape.

AUGUST 8.—Moved down this stream, again wading it constantly, for a distance of 9 miles. In fact, our trail led us through the creek itself as much as on dry land. Started hunting parties out during the day, but got no game, although Stephan ran into two caribou but missed them. We camped in a beautiful grove of cottonwood directly on the bank of the stream, where we had plenty of good grass, wood, and water; also good fishing.

AUGUST 9.—Decided to remain in camp to-day for the purpose of resting the stock and establishing a cache to be used on our return. As the day was clear, we consumed the time in drying our clothing, readjusting our packs, and developing some plates we had exposed up to this point, including some of Lieutenant Castner's that we had found in a cache on the Matanuska.

Then, too, some of the stock strayed so far away during the night we did not find them until late that evening. Here we first noticed the small fly known as the "whitestocking," on account of the color of its legs. These, with a few mosquitoes and gnats, were in sufficient numbers to keep us reminded that we were still in Alaska. Although this small pest is much more venomous in his bite than the mosquito and is far more trying on the stock, attacking principally the ears, nose, eyes, and mouth, yet he is more considerate than the mosquito in that he seems forced to take a rest at

night. The gnat shows the same courteous consideration, so that we had only to contend with a few mosquitoes during that portion of the day.

AUGUST 10.—I decided not to go down to the Indian village, situated on the lake about 12 miles below my camp, but to leave Lieutenant Castner's trail at this point. Instead I turned directly toward the north, hoping thereby to strike the divide between the Sushitna and Copper-rivers. Information obtained from these Indians at the lake by Mr. Hicks was to the effect that if we took a course somewhat east of north we should strike the left-hand fork of the Taxlena River, up which an Indian trail led to a pass through the Alaska Mountains to the Tanana River. We also calculated that we would strike what is spoken of in that country as the "large lake," which forms the head of the Sushitna River. With the exception of the first mile or two the trail passed through a very good country. The footing was firm and fine. About 4 miles from camp we came to quite a large valley, in which grew some of the best grass for hay seen on the trip. This valley must be at least 2 miles square, and is entirely covered with grass that, at this time, was standing nearly up to our waists.

For the first time on the trip the entire Mount Wrangel group was visible. Mount Wrangel is the center peak of this collection, and is very much higher than the others. During most of the time when it should have been in sight from our trail it was hidden by the clouds that hung over it. During the entire distance traveled, something like 8½ miles, we passed through large quantities of berries, principally huckleberries and moss berries. To avoid wasting sugar, I caused a quantity of the former to be gathered near camp each day and had them cooked for the entire command.

We entered what we called the "burned district," which seemed to extend as far as the country is visible toward the Copper River, and to the northward almost to the Alaskan range. This district was evidently burned a great many years ago, as none of the Indians we encountered remembered it as being in any other condition than it is at the present time. It was covered with a growth of dead spruce that was evidently killed at the time of the fire. This makes excellent fuel, is very tough, and has withstood the furious windstorms that have blown through this region for all these years without much of it having fallen down.

AUGUST 11.—Our trail still led directly toward the northeast. After 10 miles of travel we went into camp on what is known as the Twin Lakes. Here we found good grass, wood, and water. The whitestocking flies and mosquitoes at this point were so furious in their onslaught upon the stock that we found it necessary to keep them tied up for some time. We relieved the poor brutes somewhat by building smudges, in the smoke of which they were more than glad to stand. These smudges, however, came near causing us serious trouble, as some of the dead spruce caught fire, necessitating fighting the fire for over an hour. The trail for the first 8 miles was on high ground, with easy traveling. The remaining 2 miles traveled passed through some marshy places, that we crossed with but little trouble. The two streams flowing through this marsh are evidently tributaries of the Copper River via the Taxlena. This and the following day I note were sufficiently hot to make traveling very disagreeable.

AUGUST 12.—The first day out from Melishe's cabin the bell mare stepped on and injured one of my feet, while I was leading her through a marsh. It had bothered me considerably, and became so inflamed to-day as to cause perceptible lameness. In trying to favor this foot I had succeeded in covering the entire heel with a blister. Some of the trail was very uneven also, which fact undoubtedly aided in the production of this trouble. It was so ugly that I was forced to abandon my shoes and resort to a pair of tarbesos that I borrowed from our geologist.

We had traveled but about 3 miles when we came in sight of what we understood and what afterwards proved to be Lake Louise, at the head of the Sushitna River. This is by far the most beautiful lake seen on our trip. Its waters are evidently deep enough to float vessels of from 6 to 8 feet, or even a greater draft. It is dotted with beautiful wooded islands, and the country surrounding it presented the same general appearance as the lakes I have seen in the State of Minnesota. Finding a good camping place at the farther end of it, I decided to go into camp for the night, although we had only made 7 miles that day. The elevation of this lake is about 2,200 feet. The flies and gnats were worse upon our stock at this place than at any time during the trip. From this time on, however, our troubles became less and less on this score.

AUGUST 13.—We were fortunate in having a very cold night, with a slight frost, which seemed to do away to a very great extent with our pests. During all this day's travel we were passing around and between numerous lakes, and were still in the burned district. Our geologist had noted on his map seventy-four lakes in the past two days. Our camp is situated at the foot of a small knoll, alongside of a lake of the purest and best lake water we have thus far tasted. This was due to the fact that there was little or no vegetation in or around the edges of it.

Shortly after leaving camp we struck what we assumed to be Lieutenant Castner's trail, which we followed for a short distance; then, finding that it led directly to the north, we again resumed our course to the northeast. Leaving it to our left we supposed we would not see it again, but he evidently became somewhat confused at this point, because we subsequently crossed it a couple of times, but again left it and continued in our general direction. Shortly afterwards we crossed two streams, one of considerable size, and both flowed toward the Copper River. The small burned spruce trees and brush through which we passed were so thick they injured our pack covers and packs greatly, causing the wastage of nearly a sack of flour.

All of the members of the command except myself were very hard up for foot wear, being forced to make canvas shoes out of pack covers. These lasted but one or two days and kept everyone constantly at work making repairs or making others.

AUGUST 14.—Traveled through country of the same general nature to-day for 13 miles. About 3 p. m. we came in sight of two very large lakes to the eastward—our right—and evidently about 10 miles from our trail. This we took to be what the Indians called "Lake Plavezne," and if so, we knew the tributary of the Taxlena flowing into this lake could not be far distant. Travel throughout the day was very heavy on account of the moss and the unevenness of the burned district in this section. In addition to the spruce, we passed considerable dead willow and some small brush that grew to a height of about 2½ feet, which destroyed our clothing. All our clothing looked tattered and torn. My second pair of trousers would have to be abandoned, and the first pair were whipped out about a week before.

We passed no streams of any size to-day and the grass was not so plentiful, although we had no difficulty in finding enough for the stock. Berries still continued to be found in great abundance. The huckleberries were the largest we had ever seen. Many of them were oval in shape.

AUGUST 15.—The rain of last night left the atmosphere filled with a fog so dense that it would have been folly to have attempted to travel until it lifted.

After going through 2 or 3 miles of the burned district we came into some very good spruce timber, and found the traveling better than for the past few days. Reindeer moss abounded throughout this section and, generally speaking, through the whole country passed over up to this point. In fact, I might add that throughout the entire distance this moss could be readily found. It contains no small amount of nourishment, even for human beings. When made into bread in the proportion of one part moss to two parts flour it is very palatable. Some bread thus prepared by the cook of Lieutenant Castner's detachment possessed a peculiar flavor, but was quite palatable and nourishing. Eaten raw the flavor is very much like that of the ordinary mushroom.

We passed through two or three comparatively small sections covered with cottonwood trees, and noted that whenever such districts were passed we were sure to find good, firm, solid walking. In short, this was just the opposite of what one expected from the presence of this class of trees. In Texas and other Southern States it is an almost unfailing sign that one will find water in the immediate vicinity of such trees.

We went into camp, after traveling 11 miles, on the bank of a small lake surrounded by deep moss, with only a fair amount of grass for the stock. We were lucky to find enough high ground close to the shore that was dry enough for camping purposes.

AUGUST 16.—Started out the guides some time ahead of the command, because an examination of the country from the top of a cottonwood tree climbed yesterday showed considerable swampy ground covered with dense undergrowth, with trees all around, and it was desirable to give the guides ample time to find an outlet. This marshy place seemed to be of unlimited extent, but two hours' farther travel brought us to the largest stream on the trail. Both sides of this river were lined with cottonwood trees, many of them of good size. On

the opposite bank we discovered our guides, indicating clearly that the stream was fordable, and yet its appearance did not indicate this, as it was of rather slow and sluggish current.

As one of the mules refused to eat anything the night before and the bell mare was about played out, I decided to go into camp after crossing this stream, where we found excellent grass. Although it was still raining we managed to do some washing, which we dried by a large fire.

AUGUST 17.—We traveled down this river about a mile, when we again resumed our original direction, and traveled through a marshy and mossy district for a distance of 9 miles. Even well up on the foothills we crossed we found the moss deep and the water standing in holes, although the declination of some of these hills was more than 30 degrees. During this day we traveled 2 or 3 miles over a peculiar kind of grass that was very appropriately named by one of the party, and afterwards generally known by all of us, as "waltzing" grass. It grew in bunches or tufts that projected a foot or more above the water surrounding it. Each tuft is separated from its neighbors by a space of from 4 to 6 inches, in which there is water 2 or 3 feet in depth, so that one is compelled to step on the top of one of these bunches to avoid getting into the water. The surrounding space admits of considerable movement or vibration, so that one requires a steady nerve to balance himself on top of the bunch he selects for planting his foot. It made one literally dance about to retain his equilibrium, in which he too frequently failed, and found himself with one foot vibrating on one bunch of grass, the other in water, and mud and roots up to his hips. A mile of this sort of travel not only fatigues and shakes up a man very badly, but spoils the best disposition on earth. I was much impressed with the intelligence displayed by the animals which were forced to pass over this sort of grass. They certainly showed great patience and skill balancing themselves on this most uncertain footing, which is rather remarkable, particularly for the mules.

A short time before going into camp we found a trail—evidently of some white men—that passed up the small creek on which we stopped for the night. Both men and animals were exhausted. One mule was completely played out and another nearly so. We passed through considerable spruce and small willows, also some cottonwood and birch, the last

two in small districts only. We found ourselves north of west of the most northerly of the Wrangel group of mountains, Mount Sanford. In passing over the lake district to-day one of the party killed two young swan, but succeeded in getting only one of them. This we made into a stew with rice and found it was more than enough for one meal for all of the command. The streams crossed to-day were all sluggish, and the waters of both lakes and streams presented a yellow appearance, which we attributed to moss stain.

AUGUST 18.—The creek on which we camped was so small we anticipated no trouble in crossing it; but the banks on either side were very abrupt, and the bell mare, with characteristic awkwardness, fell down into the stream, causing a delay of nearly an hour to get her out. We then threw a light bridge across, over which the remainder of the train passed without difficulty. The traveling was so heavy on account of the moss, waltzing grass, etc., that we did not make to exceed 1 mile an hour.

The stock, already much wearied from previous travel, were not only completely exhausted, but succeeded in skinning their legs badly, especially around the fetlocks, in striking roots concealed in and around the waltzing grass. Even on the steep slopes of the hills and mountains the traveling was heavy, as the ground was covered with moss, besides being boggy and rocky in places. In addition, we were forced to pass through several short stretches grown over with high willows so thick that much cutting was necessary to get the train through. The remainder of the country was covered with small brush that whipped our clothing into rags. Two or three days more of this and the command would have been naked. We crossed a hill, with an elevation of 3,700 feet, at a point about 400 feet below the summit. On account of the wet and exhausted condition of both men and animals on reaching this summit, we decided to go into camp at the first good grass we came to, which we found after about a mile and a half of travel.

It rained enough in the forenoon to thoroughly wet the underbrush on the trail, which kept us saturated the entire day. Our discomfort was completed by a heavy rain that lasted from the time we pitched camp until midnight.

AUGUST 19.—We calculated that we had traveled, up to this time, 222 miles from Knik Station. We had arrived at

a point where it was necessary to make some preliminary examination of the country in our front before deciding upon our future course. Our guide stated positively that we should not, under any conditions, advance to exceed ten days more, since the chances were very much in favor of the Matanuska River being frozen on our return, which would certainly cause us to lose all of our stock. I decided, therefore, to take advantage of this clear day to have the guides climb some of the adjacent foothills to ascertain if there were any prospect of finding a pass through the mountains in front of us. Nearly all of the command went out hunting while the guides were gone. They were unsuccessful, although there were plenty of caribou signs all around us.

The Alaskan range to the eastward or toward the head of the Copper River presented a most forbidding aspect; but to the northward there appeared some evidence of a chance to get through to the Tanana in our limited time.

Mr. Hicks, the guide, returned about 6 p. m., reporting that he could discover no opening directly toward the Tanana, but he was positive that he saw a pass through the mountains that would bring us out toward the head of the Sushitna River. He plainly discovered, also, a pass through the range to the eastward, about 40 to 50 miles distant in a direct line. I judge this to be the pass mentioned by Lieutenant Allen as being to the westward of the route followed by him. If so, it is directly in the territory assigned to Expedition No. 2 for investigation, so that I do not feel called upon to examine it. It is sufficient for my purpose to feel assured that this pass can be readily reached from the trail followed by myself. The country from our present location to this pass is an open one, with no obstacles except the Christachina River. Our orders directed that all expeditions communicate with each other, if practicable, so I decided to permit Mr. Kelly to go across for the purpose of examining this pass, if he felt so disposed, and at the same time agreed to furnish men and stock to accompany him. The only real gain, if any at all, to result from this would be the possibility of establishing communication with Expedition No. 2. But this was regarded by all of us as being rather remote. In view of this fact, the lateness of the season, the distance from our present location to that point, and the possibility of his failing to join my own party on its return, Mr. Kelly did not think it wise to go across, which conclusion all concurred in.

We found by observation that Mount Sanford, of the Wrangel group, lies south 60 degrees east of us. We calculated that the Copper River was not to exceed 30 miles from us. About 6 or 7 miles to our right we could readily trace a stream flowing through two rather large lakes, which we took to be the Christachina River.

Mr. Kelly reported having found a plainly marked trail to our left that ran directly north toward the mountains. This I decided to take the following morning, in the hope that it would lead us into the head of Johnson River, down which, we had been informed, was an Indian trail to the Tanana River.

The footprints of the white people discovered just before we went into camp yesterday evidently followed this trail. On the Christachina River also we found considerable evidence that it had been passed up by white men this season. Although the grass in the willows was abundant and nutritious, our stock succeeded in breaking into the packs and destroying a 50-pound sack of flour. This was a serious loss.

AUGUST 20.—Having sent the Indian and one guide forward to pick up the trail referred to yesterday, we followed with the command about two hours afterwards. Traveling about 5 miles farther, we struck this trail and followed it for about 7 miles, where we went into camp behind a small knoll, well protected from the wind, and which had been used for some time as an Indian camping place. A small stream, evidently a tributary of the Christachina, flowed directly by us, and it was full of grayling. Neither this stream nor those we crossed for the past few days carried any gold. We passed very close to a couple of caribou—a doe and a calf—but failed to get either. We were surprised to find that a caribou doe has horns very similar to those of the buck. These animals are as full of curiosity as the antelope of the Western plains, and seemed much interested and curious about our pack animals, which they had never seen before.

AUGUST 21.—The rain of the night before continued throughout the day, with slight interruptions in the forenoon. We were now satisfied that the trail we were on was not simply a game trail, as it gave evidence of having been in use by the Indians for a long time. Our general direction was still almost directly north. We had traveled 14 miles from camp when one of our mules stopped and refused to proceed

farther. As there was no wood to be had, it was necessary to push on, since it was too cold to attempt to go into camp without fires sufficient to dry out our clothing. Just before entering the pass in the mountains our trail led us through a beautiful network of lakes. The waters from some of them apparently have no outlet, while that of others seemed to flow in opposite directions—i. e., toward the Copper and Tanana or Sushitna rivers.

About 12 miles from camp we ran into a trail we assumed to be Lieutenant Castner's. If so, he had lost one head of stock since we last saw his trail, but had picked up a couple more Indians to pack for him. In any event, we now felt satisfied that we had struck some pass that would lead us to the Tanana River. We passed through an abundance of huckleberries, growing more luxuriantly and apparently larger than those nearer the seacoast. I find from my diary that mosquitoes and flies had not bothered us for several days, and this was the last mention made of them. The constant rainfall of the two weeks past had rendered outdoor life, and especially traveling, very disagreeable.

After making the longest march of the trip—17 miles—we went into camp on a large-sized creek, where we had excellent grass and wood. So fine was this grass the stock did not move from one small spot, of less than one acre, during the night, and gave evidence the following morning of being thoroughly satisfied. I was the only one of the party who contended that the waters on which we were encamped flowed into the Tanana River.

AUGUST 22.—A few hours of sunshine in the morning were very acceptable, as it had rained hard all night. We passed two camps of the party in front of us. We then felt that we were over the divide and the chances were excellent for reaching the Tanana.

AUGUST 23.—We had not gone 100 yards from camp when we were thoroughly soaked again from the wet brush through which we were forced to pass. After traveling about 2 miles we came in sight of an Indian camp. This proved to be a party of Copper River Indians who had come up into the mountains for the purpose of hunting.

This was the first sign of Indian life seen by the command since leaving Knik Inlet, a distance of 270 miles. After passing this camp we climbed up over a divide whose elevation is 3,425 feet. On the top of it we found traveling very

heavy, due to the deep, spongy moss. Went into camp about a mile beyond a glacial stream, which we forded with difficulty late in the afternoon.

Just opposite the Indian camp a very considerable tributary flows into the river (Delta River) down which we were traveling. We named it Wilder Creek. I find I made a note stating that a practicable trail for pack animals, a railroad, or wagon road, can easily be made over the route we traveled. I am satisfied that to the right of the trail followed we can find a lower pass that should bring us out somewhere near the mouth of Phelan Creek.

After being in camp for an hour or more, Stephan came in, bringing with him one of the Copper River Indians belonging to the camp we passed. He had carried a piece of caribou meat for 9 miles and wished to exchange it for some tea and flour.

I endeavored to induce him to carry a note forward to Lieutenant Castner for me and to start early the following morning. This he agreed to do, but imposed the condition that I should permit him to go back to his camp before starting. As I could see no gain in his making an extra tramp of 18 miles before gaining any distance forward, I declined to accept his services.

AUGUST 24.—To-day I started Private Canwell and Stephan ahead with the note to Lieutenant Castner, giving them ten days' rations, with instructions to pursue the trail during the hours of daylight until they overtook him. I was impelled to do this because his trail gave evidence of his having had trouble. I followed with the main command shortly afterwards, and had traveled about 5 miles when we came to a couple of glacial streams.

The water in each of these streams came down with terrific velocity, carrying quite a number of small icebergs that had broken from the glacier. This did not render wading them any more seductive. After considerable delay we managed to cross the first one, but the second, although much narrower, was evidently very much more dangerous. I found that Lieutenant Castner, to avoid fording, had led his stock up over the glacier from which it flowed. So it was decided to follow his trail on foot, to determine if it were practicable to bring the pack animals over the same route. I soon saw it would be the extreme of folly to permit loose animals to go

over such a glacier. I confess to have experienced considerable fear on my own part during my trip over it. The top consisted of loose, soft earth, throughout which was a confused mass of ice and stones or bowlders of all sizes and descriptions; interspersed were numberless perpendicular holes. Through every part of this glacier, running down to the water below, were large, open seams, between which the surface seemed crusted and presented very much the appearance of loose soil from which frost was escaping, except that the seams and crusting in this case were magnified.

At one or two places, upon coming to the top of a rise and looking over, I found myself gazing down to a depth of from 100 to 300 feet through an opening in the glacier, where I could see and hear the raging torrent below and feel my hair gradually but surely lifting my hat. With almost every step, as the loose earth, etc., would give way under my weight, I felt that at any moment the entire underpinning was liable to give way and then to find myself suddenly floating in the roaring torrent below me. I find a note in my memoranda of that date to the effect that the only satisfactory idea to be obtained of a glacier is for one to actually cross it, and when one has actually had this experience he will agree with me that glaciers are not safe trails to travel over.

AUGUST 25.—Our camp last evening was in a grove of spruce and cottonwood, directly on the bank of the Delta River, with only fair grass for stock. Although it rained all night, we managed to keep dry by spreading our sleeping bags underneath some very heavy fir trees. We had proceeded about 2 miles when we came upon a dead mule that had been abandoned by Lieutenant Castner, and from which he had taken a a good-sized roast. After passing this point the trail passed through a flat for about 3 or 4 miles, when we were forced to climb up a hill directly against which the main current of the stream ran. This hill was covered with a very thick underbrush and bowlders that were concealed by the moss growing over them. Through this our progress was necessarily slow and tedious. We had just come down from this hill into the valley again when we met our Indian Stephan, accompanied by two Matanuska Indians. From him I learned that Lieutenant Castner was in camp about 2 miles ahead of us; so I decided to camp with him. I also learned from him that Lieutenant Castner had been compelled to kill his bell horse.

The poor brute had become so weak that he could not retain his footing on the trail, so fell down and into the river, from which they were unable to extricate him. The actions of Stephan and the other Indians were very peculiar. They all seemed to be afraid to return to Lieutenant Castner's camp, and I found it impossible to keep Stephan at the head of the train, where he usually walked from preference. I insisted on this, however, and held him there until we actually turned into the camp, when he suddenly darted to the rear of the train. In seeking a cause for this action I learned that when Lieutenant Castner found it necessary to shoot the mule and horse he remarked, in the presence of these Indians, that it was a bad mule and a bad horse, so he killed them, and that the same thing should be done to a bad Indian. They evidently believed this fate was in store for them at any moment, hence their display of fear.

From Lieutenant Castner I learned that he had nearly completed a raft on which he intended to float down the Delta to the Tanana, thence down to the mouth of the latter. That he proposed killing his only remaining mule on the following morning, when he would have been ready to start on his trip. He had succeeded the day before in securing a sheep and also had a supply of mule meat still on hand. I was much surprised to note that although he was supplied with both mule meat and mutton, he much preferred the former, and I admit it was very toothsome.

I was glad to note that his command, including himself, was in fine physical condition, but badly off for clothing, especially footwear. All were practically barefooted and had manufactured some tarbesos out of leather taken from an abandoned aparejo, to protect their feet from the rock and rough country generally.

AUGUST 26.—After traveling over a foothill for about a mile and a half our trail led through a rather broad valley covered with small spruce, cottonwood, and alder. We found abundance of bunch grass of good quality covering extensive areas. Much of this presented the appearance of swamp grass. After traveling about 10 miles we crossed a small creek and then climbed a hill to a small lake. This hill runs abruptly down to the river, whose bed at this point is about a mile in width, with a valley on the other side about the same width. The indications pointed to our being near the mouth

of the Delta, and therefore near the Tanana. As we caught up with the advance party of trail cutters at this point—12 miles of travel—we decided to go into camp.

The attempt at panning to-day resulted in finding no colors. Our results in panning all streams through this range of mountains have been the same. The indications, however, are better than in the coast range. A nice-looking piece of float quartz was found in one of the streams we passed this date.

AUGUST 27.—My sleep during the night was interrupted several times on account of the cold. This was a sure indication that our time for turning back was near at hand. In fact, this was the day set as being the last for advancing, but have decided to go on at least two days more, in order, if possible, to reach the Tanana and assist Lieutenant Castner and party across the stream. The two small Spanish mules that belong to the horse train managed to lead all the stock off, striking the back trail, during the night, and this notwithstanding the fact that the grass in which we had placed them was excellent. We did not catch them until they had nearly reached the last camp, so did not get started until the afternoon.

We had only gone about 2 miles when we were met by one of the advance party, who informed me that the guide had found it impracticable to cross a ravine in our front. To get through we must cross over the hill instead of going between it and the river, as we first intended. We went back about three-quarters of a mile to the small creek we had crossed, in the meantime sending the guide up on this hill to see if it were possible to find a practicable trail. On his return he reported that he went up on quite a high point beyond, from which he was satisfied that he saw the foothills on the other side of the Tanana, and which river he figured was not to exceed 20 miles from our present location.

AUGUST 28.—Another cold night. The ice on the water buckets was not quite so thick as it was yesterday morning. As it was necessary to cut a mile or two of trail, started an advance party out very early. Cut off bacon for supper last night, as our supply was short and work that day had not been hard. The elevation of the hill did not exceed 1,200 feet. We traveled all day and until about 5 p. m. to make 15 miles. Nearly all of the time we were above timber line and were unable to cover a greater distance than this on account of having to cut the trail for the last 6 miles.

The mule train was very badly in need of rest, so decided to send them back to good grass, with instructions for the men of the party accompanying them to go into camp and hunt for fresh meat until my return.

Around and near a large butte we left to our right to-day we found game signs more abundant than at any point since leaving the seacoast. Private Blitch, who went hunting, did not put in his appearance during the night. I felt no apprehension, though, for his safety, as he was a skilled woodsman and hunter.

AUGUST 29.—I had just started from camp, with the train, when we received word that Private Blitch had returned, so waited until he caught up with me, as I desired to send him to Circle City with Lieutenant Castner. The trail led through a comparatively good country until we struck the high bluff bank of a creek, down which we finally went. Went into camp about 12 miles from our starting point of the morning. There was a dense growth of good-sized spruce trees so far as we could see to our front. So close together did they grow that it would be impracticable for our large unled pack animals to pass through them without considerable trail cutting. Added to this was the heavy traveling due to deep moss throughout this belt of timber.

After consultation, it was decided that Lieutenant Castner should take the two smallest mules, with such rations as the party could spare, and proceed to Circle City, while I, with the rest of the command, should return to Cooks Inlet, as directed. In taking account of our stock of provisions I found we had very much less than half the amount of flour we used in coming this distance. We were practically out of bacon, so must procure fresh meat to avoid suffering on our return trip.

In the consultation above referred to there was no dissent from the opinion that the main party had already advanced too far to count upon the stock returning alive, and I was particularly anxious to save them as my action in purchasing them had not yet been approved.

All agreed that should we have an early freeze-up of the Matanuska River—it froze the 10th of September last year—we would certainly lose all of them. Then, too, nothing of special importance could be gained by the advance of the main party, since Lieutenant Castner, as equipped, could get

all information desired. In addition, my latest orders directed that only a small party be sent through from the Tanana River.

AUGUST 30.—As soon as the division of rations could be effected, Lieutenant Castner's party packed their supplies on the two mules assigned him, photographs were taken of the outfits separately, and we parted about 9 a. m.

I find noted on my record that while there was a small shortage in flour and bacon issued to Lieutenant Castner, he was supplied with extra rice, sugar, beans, tea, etc., so that he was fully supplied with rations for thirty days, assuming that he lost none.

After his command had left, I packed up and returned over my back trail for 15 miles, going into camp on a small lake in the foothills. It commenced to rain after we reached camp and continued throughout the night and following day. This was accompanied by such a strong wind that we were much harassed in our efforts to cook supper and breakfast. The day had been dry but very close and uncomfortable. The grass at this camp had commenced to turn yellow from the frosts and was not readily eaten by the stock.

AUGUST 31.—Traveling to-day was rendered exceedingly disagreeable on account of the heavy wind and rain storm. We had been out about half an hour, when directly in front of us and less than 100 yards distant stood two caribous, a buck and doe, whose extreme curiosity in regard to the pack animals held them in their tracks until the head of the train arrived within 50 or 60 feet of them, when they leisurely trotted away. Of course we had no guns with the train at that time.

We had just reached the top of the divide when we observed the camp of the party I had sent back with the mule train. They were so near our point of separation that we felt certain they had secured fresh meat. Our surmise was correct, for upon arrival at their camp a few minutes later we found the Indian had killed a large moose the previous day, and one of the men had killed a young caribou, which gave us about 600 pounds of fresh meat. This was entirely too much to attempt to pack on our stock in their then reduced condition. Besides, to attempt to carry it in the kyaks would surely result in spoiling a considerable portion of it. Stopped long enough at this camp to permit the members of the command to eat all the fresh meat they wanted and to pack the remainder.

From this point we changed the trail, thereby shortening the distance to the next camp about 2 miles, besides finding much more solid ground to pass over. Game signs, including moose, caribou, bear, wolf, and fox, were more abundant here than at any place we had passed over, especially around some lakes that we passed about 1 mile back. Our camp was located on solid ground, covered with cottonwood and spruce, on the banks of a running stream in which fish abound. Grass in abundance, although it was injured by the frost. I gave the command permission to eat all the fresh meat they wished, because to-day's experience convinced me that the pack train would not be able to carry to exceed two-thirds the amount we had secured. Therefore, I selected the best cuts, removed all the bone, and hung what was left under an Indian tent frame in hopes it would be found by some Indian of a hunting party.

SEPTEMBER 1.—The rain continued all night and all day. We were forced to cut short our march in order to take advantage of good grass. Notwithstanding the reduced condi- of the stock, they seemed to realize that they were traveling homeward, and pushed along at a much faster rate than when advancing.

The wood in this camp consisted of willow and green spruce. Both were very wet, so that a hot fire for cooking purposes was impossible. In addition, the rain put out our fires almost as fast as we could build them.

SEPTEMBER 2.—The stock fared better last night than for some days past. We passed two of my advance camps this day and made 16 miles. The march was much dreaded by all hands, because we had to cross the glacial stream that gave us so much trouble on the advance. We found that both streams had changed their channels in the short time we were away, and still more satisfactory was the discovery that they had fallen so much that we easily forded them. The only real inconvenience in crossing these streams was to find one's shoes filled with a very coarse gravel, carried in their waters, which necessitated removing our shoes and stockings to avoid making our feet sore. To remove one's shoes when wet, and when one is thoroughly chilled by the ice water, is not only unpleasant but difficult.

Went into camp on a small stream, with plenty of good grass and dry wood. Shortly afterwards, however, this stream

suddenly began to rise, and succeeded in driving the cooks from the kitchen and carrying their fires away. We noted that the snow was rapidly climbing down the foot hills. This made it very cold in the valley at night.

SEPTEMBER 3.—It froze very hard last night, and was still freezing at 7 a. m. We again changed our route in crossing the divide to-day, finding much firmer ground to travel over and not nearly so much bog. As the grass was badly frozen last night we stopped four hours at noon to permit the stock to fill up on some good grass we struck at that hour, and also utilized the time to dry out the wet packs. The afternoon's travel was full of thick brush, which tore everyone's clothes. Everybody at this stage used all his spare time when in camp to repair his trousers, shoes, etc. Met some Indians at this camp, who promised to trade some moccasins for rations, or sell them, as we preferred.

SEPTEMBER 4.—Rained all night upon us so that both men and animals were in bad shape to start in the morning. My own night was far from comfortable, as I was aroused several times to pour the water out of my ears or stop it from leaking down into my neck. This occurred notwithstanding the fact that the flap of my sleeping bag was thrown over me. It was not a very cheerful sight on the following morning to watch every man in camp trying to pull on his wet clothing, the water in which was almost freezing at the time. The cold raw wind and sleet blew in our faces during the whole day, and we were forced to cross a divide covered with moss. We had just reached the farther side when two of the mules, without any warning, suddenly stopped and refused to proceed farther. We used every effort to induce them to do so without success. Shortly afterwards the bell mare gave out in a similar manner. By frequent rests we managed to get her about half a mile farther, when, finding her absolutely unfit to proceed, I gave the order to shoot her, taking the precaution to send all the mules some distance ahead before doing so.

This left three full packs to be distributed among that portion of the command who were at the rear of the train. My own share was just half an animal's load. We had gone but a short distance farther when we came to a small creek that gave us no trouble whatever on the advance, but which, by reason of the continued rain, was so swollen as to swim

the animals. We avoided this by going up the stream for a considerable distance. Finally we arrived at a place about 3 miles beyond this creek which we called "Camp Discouragement." The moss there was thick and underlaid with water, which, combined with the rain from overhead, thoroughly soaked all hands. In addition to the other discomforts, our trail was the most dreaded of any on the trip for the stock on account of one slope of the divide being covered with granite bowlders that were concealed by the moss, rendering the breaking of a leg by stepping into the crevices between them a constant and ever present danger.

Besides the three animals just mentioned two others gave out just before we went into camp. We removed their packs where they stopped and they joined the herd after resting for a time. A striking peculiarity in regard to the way stock plays out in this country is worth noting. Each of the animals, although giving evidence of fatigue, was bright, quick, and apparently sound in every way, carrying his pack without effort, but five minutes later would suddenly and without warning stop in the trail and give every evidence of intense suffering and complete exhaustion. No amount of coaxing or abuse would induce him to move. The only thing to be done was to then and there abandon him. In every instance when this was done in that country it was regarded an act of mercy to shoot the brute, since his subsequent death and destruction by wolves was certain.

SEPTEMBER 5.—As the weather gave indications of breaking away in the morning, I decided to remain in camp during the forenoon, so as to give the most promising of the played-out mules as much chance to recuperate as possible, and also to send back beyond the creek for the two we abandoned at that point. One of these was brought into camp, but the other was too far gone to do anything with him, so by my order was killed. He was suffering at the time so acutely this was an act of mercy.

As the remainder of the mules had made friends with and were following the new bell mare, the best rustler for grass in the train, we had hopes of saving more of them.

From the Copper River Indian who, attracted by our fires, had come into our camp in the early morning, I learned that in his camp, several miles distant, they had plenty of moccasins besides tanned moose and caribou hides. So I sent Private

Von Schoonhoven and one of my own Indians over there with him, with instructions to meet us at the designated camping place that night. This they did, bringing with them four pairs of moccasins and a few scraps of tanned moose skin.

At this point we were 100 miles from our cache on Bubb River and 250 miles from Knik Station. As we had but little flour on hand, I cut off the bread ration, using rice as a substitute. We had no bread the following morning, nor for lunch.

SEPTEMBER 6.—A very cold night attended with frost showed its effect upon the stock in the morning. We were much gratified, however, to find that all of the stock made the distance of 17 miles with us this day.

SEPTEMBER 7.—In order to avoid the deep moss on the east side of the hill, and which gave us so much trouble in advancing, I sent one of the guides ahead with orders to blaze the trail along the west side unless the Indian trail that we followed proved plain enough for us to find. By this change we saved about 5 miles in distance and found our trail passed over much firmer ground.

We selected a camp on the shores of a lake because green grass could only be found near the water. The timber passed through was very small scrub spruce, some willow, and cottonwood. The last 2 or 3 miles was the extreme northern boundary of the burned district previously referred to.

SEPTEMBER 8.—Our trail to-day must pass through considerable soft country, including the creek and Gakona River, both of which in all probability would have to be rafted over. We had just stopped at this creek and were preparing to swim the stock across when four prospectors, with two pack animals, showed up on the other side and informed us that they had been forced to raft across the Gakona River the day before, and that we would be compelled to do the same, but that we could make use of their raft, which they had taken the precaution to save.

When these prospectors ascertained the condition of the grass in the country through which we had just passed, and the distance they would still have to travel in order to reach the Tanana River, their destination, they decided to return with us. From them we learned also that another party of prospectors had been passed by them a few days before and were pushing slowly forward with worn-out stock. I also

received a copy of the Seattle Post-Intelligencer of July 29, containing the information that Spain had sued for peace. In due course of time both the creek and the river were crossed. From this party we borrowed a small amount of flour, enough to last for three or four days by limited issues. As we had been without bread for two days we decided to go into camp, where we filled up on flapjacks fried in moose fat.

Bathing in the ice-cold water of this river was far from comfortable, but as it was our only chance we regarded it as a necessity.

SEPTEMBER 9.—We again made a cut-off in the trail this morning, saved nearly a mile, and secured much better ground to pass over. This was a material gain also, as we lessened the amount of swampy land.

We had traveled about two hours when we met Messrs. W. H. Marshall and Charles Hubbard, who, with packs on their backs, were pushing ahead for the Tanana River. These men had started from the Knik with two horses, both of which had given out, the last one having been left in their camp that morning, about 10 miles from where they met us. This party was in very bad shape. They had more baggage than they could possibly pack themselves, and their animals were in such condition they could scarcely carry their saddles.

As three of the mules of the train, although carrying nothing but their pack saddles, had constantly delayed the progress of the command, and as the Marshall party intended to return to the Knik and agreed to bring in these three animals for me, if possible, I arranged to leave rather than kill them at this time. We also secured from them some footwear for three members of the command.

SEPTEMBER 10.—After disposing of the three animals that had delayed our progress up to this point, we changed our previous method of marching. Instead of keeping the animals under packs until we had made a full day's march, we stopped for three or four hours for noon, in hopes that the stock would fill up with grass and could then make longer marches with less fatigue. At this time our stock of provisions had run very low. We had but two meals of rice, practically no sugar, flour, or beans, and only one mess of dried apples.

We passed near and parallel to Lake Louise for a distance of about 3 miles, covering this portion of the trail on the

return trip vastly more comfortably and with less fatigue than on the advance.

SEPTEMBER 11.—The grass to-day was so badly frosted as to deprive it of all substance. We experienced from this time on the greatest difficulty in finding any that the stock would eat, and none that seemed to be satisfactory to them.

One of our horses played out completely, but she was a young animal, and we hoped by removing her pack to save her. We passed over considerable marshy and boggy land, with but little grass or wood, except stunted spruce, in the burned district. Some of this district showed evident signs of being a glacial deposit. We again changed the trail, avoiding some of the worst ground we passed over in advancing. Notwithstanding the fact that we attempted to cross the creek some distance above where we crossed when advancing, we were much bothered and were forced to bridge it and to corduroy the approaches for some distance on both sides of it.

We went into camp on a small creek about a mile beyond this boggy place with our stock completely exhausted. If they would hold out for one more long drive we should reach the Bubb River. We were out of provisions, with the exception of a little flour and a small amount of bacon and tea.

SEPTEMBER 12.—Broke camp in a rainstorm that had prevailed all night and which was accompanied by a heavy fog in the early morning. Reached a small creek, in the valley of which was a fine meadow, where we stopped for noon. All the bunch grass in this vicinity was drying rapidly and had but little substance on account of the constant frosts, although the stock seemed to eat it better than any we had had for several days.

In camp at this place we found Mr. Macht, of the Marshall party, from whom we procured enough sugar for our tea at lunch. We also secured from him one pair of leather and a pair of rubber shoes. He was packing the goods of the Marshall party back to Bubb River, where he expected to await their return.

After waiting for about three hours we again started for Bubb River, where we arrived about 5 p. m. An immediate examination of the cache showed that it had not been tampered with by anyone. As I now had more than enough flour to carry us back to safety, we divided all we could spare into two parts, that I caused to be fed to the stock at night

and on the following morning. Every animal ate it eagerly, and showed every evidence of being strengthened thereby.

As some arrangement was necessary to procure food for these animals if they were to be returned to Knik alive, I ordered Private Von Schoonhoven and Stephan to proceed by forced marches, on foot, to Melishe's cabin, 141 miles distant, and to make use of every available means of transportation to push forage up to meet the command. This party got an early start on the following morning, and I subsequently learned that they made the distance in the remarkable time of four days and two or three hours. In order to accomplish it, however, they traveled almost day and night, passing over several very high mountain passes that were covered with snow in places to a depth of 18 inches, and all of the first 80 miles was covered with a dense growth of spongy moss. This was one of the most severe tests that any of my party had been put to up to this time, and, judging from its results, worthy of the highest commendation.

The Indian became so fatigued, on several occasions, that he insisted on stopping, and it was only with the greatest firmness and insistence that Private Von Schoonhoven was enabled to hold him up to his work.

The promptness with which this order was carried out unquestionably resulted in saving every head of stock I then had with me.

SEPTEMBER 13.—In order not to overload our stock, we found it necessary to abandon some of our camp equipage, photographic material, and personal effects. Some of this the Marshall party agreed to bring in if possible. Our sick animals still managed to carry the empty saddles and to keep up with the train.

We left our trail on the advance at this place, and after climbing up onto a high ground set our course directly for the head of the Matanuska River. The trail, although covered with moss, we found much better than was anticipated. Traveling in the rear of the train or where the trail was broken was very good indeed.

During the day we saw a number of Indian camp fires in the distance to our left, and finally went into camp on a sidehill. Here we found good grass, being afraid to pass it by on account of the condition of the stock.

We were in plain view to our left of one branch of the Taxlena River, which flowed near the foot of the coast range of mountains. This stream, we were informed by our Indian (Andrew), carried about two or three times as much water as the Bubb River. He also informed us that on the farther or south side of this stream there was a practicable trail for horses down as far as the Copper River. Three large glaciers evidently empty their waters into this stream. The Indians reported to Hicks that over the middle glacier a few white men had come this year. Over the one farther to the east a great many men and horses had passed. From this information we inferred that this was a branch of Valdez Glacier, though this inference, from subsequent information, was probably not the correct one. It was more than probable, however, that these connected with the Valdez Glacier.

SEPTEMBER 14.—A very cold night, with heavy frost. We had considerable difficulty during the night to prevent the stock from breaking into our flour, of which they had been given a taste. A cold wind blowing into our faces indicated that fall had set in and we were none too early in getting back to the inlet and safety.

Shortly after noon we crossed the last stream that empties into the Copper River. From this time on the waters flowed toward Cooks Inlet via the Matanuska River.

Our noon lunch was cut short on account of the cold wind that accompanied the rain, and we were forced to camp on or near the divide. We passed two or three lakes of considerable extent, only one of which, and that the smallest, constituted the head of the Matanuska River. After traveling 16 miles and finding a small quantity of tolerable grass, decided to go into camp. Our guide had gone ahead to make an examination of the country and get his bearings. He returned shortly after dark, packing on his back a young mountain sheep.

SEPTEMBER 15.—After traveling about 3 miles our trail turned abruptly into a flat country. Here we found a stretch of territory that was burned over last year and over which a splendid young green grass had grown. The stock was so ravenous for this it was impossible to drive them down the trail. Traveling about 2 miles farther, we decided to stop for lunch and give them plenty of time to fill up on this especially fine feed. We traveled about 8 miles in the afternoon, making the total distance for the day 13 miles. We went into

camp at the mouth of Caribou Creek, where we found an excellent grass that was still green. We were fortunate in having very little soft ground on to-day's trail, but were much exercised about getting the animals over a short stretch of soft ground of 200 or 300 yards, which presented a peculiar yellow appearance that consisted of wash from the mountains on our right. It was probably some form of iron.

At the mouth of the Caribou was located the cache of our guide, Mr. Hicks, which had been used by him for two or three years to cache stores that he traded with the Indians.

SEPTEMBER 16.—On account of having such good grass at this point, decided to rest for a day.

Caribou Creek empties into the Matanuska River from the north at this place, and where the latter flows between the Matanuska Glacier and Glacier Point. This is one of the most picturesque and interesting spots we saw in Alaska.

SEPTEMBER 17.—As we were reasonably certain that the greater portion of the day's route would be through the forest, I sent out an advance party of trail cutters to prepare it for the passage of the pack train. We climbed the east bank of Caribou Creek, leaving Glacier Point to our left. After traveling over a very good trail for not quite 12 miles we came to Hicks Creek and went into camp near its mouth.

Our camp at this point was a very narrow, contracted valley, where Hicks Creek empties into the Matanuska River. This valley is about half a mile square and completely shut in by high, precipitous mountains, all of which were covered with recently fallen snow. The trees were small cottonwood, whose leaves had taken on beautiful autumn tints and had just commenced to fall.

From this point we figured that we should not have to exceed two or more miles of trail cutting before we reached the trail followed on the advance. There is no question but that a pack or wagon trail, or a railroad, can reach the Bubb River by the trail followed on our return. Improvement in the grades could be found, no doubt, particularly at this point. Our present camp could be, with advantage, left to the right in going up the river, and thereby avoid some steep climbing. This would necessitate the construction of some bridges over Hicks Creek and its tributaries.

SEPTEMBER 18.—We got an early start and succeeded in crossing the creek by means of foot-logs thrown over it,

thereby avoiding wet feet early in the morning. Our trail wound up a very steep hill, covered with windfall that delayed us somewhat. We managed to get the stock through it without much difficulty, and were gratified to find, after traveling a mile and a half, that we were in the trail followed on the advance. Nearly two hours had been consumed in making this distance. The trail from this point was a gradual but continuous climb. At different points along this trail we found an abundance of red currants fairly ripened. With the exception of cold nights, no better weather could be asked for than that we had for the past two or three days.

SEPTEMBER 19.—The weather was still fine for traveling, and we had the broken trail from this point on, which was much improved by previous travel of my own and other parties.

We reached what is generally known as "Sunset Camp," where we found Mr. Kelly. At this point I had cached our medical and surgical case. Both the surgical and medical case furnished for this expedition, although supposed to be adjustable for carrying on pack animals, was unsuitable for an expedition into Alaska. Being a square box about 18 inches wide, with brass corners, it projected so far from the sides of the pack animals as to render it exceedingly difficult for them to avoid striking trees along the trail which other and larger animals passed without difficulty. In addition to this, it possessed no flexibility, and, in short, would not and could not adjust itself to the shape of the animals, so that the corners almost certainly caused friction and raised sores or lumps on the sides of the unfortunate brute carrying it.

We arrived at Schoonhoven Creek about 2 p. m. and went into camp. From there we sent two of the packers across to the cache on the other side of the Chicaloon to secure the rations stored there by Sergeant Mathys for my command. Two other head of stock were about played out, and, in fact, all of them were exhausted, so I decided to rest here for a day.

In the cache we found flour, sugar, bacon, coffee, pepper and salt, and a large covered kettle. All of these we needed. As from this time on we would find enough to live upon in the different camps I had selected, I decided to feed the stock some flour. Some of the party saw two moose very near our camp. As soon as the intention to lie over for a day was announced everyone was anxious to utilize the time in hunting.

SEPTEMBER 20.—Immediately after breakfast, 6 a. m., I sent Private Canwell ahead on foot to go as far as King Creek, with orders to the men in charge of the forage to push on to my present camp as soon as practicable. About 5 p. m. we were much gratified to have Privates Woodworth and Evans cross the creek right at our camp with four sacks of oats on three head of reasonably fresh stock.

From them we received a Seattle paper of August 8, but no mail, as it had not been sent for at the time of their departure from Knik Station. I also received a report from Lieutenant Learnard, dated August 11, indicating very satisfactory work by his party up the Sushitna River. It was most unsatisfactory, however, to know that Sergeant Mathys and party had failed to form the junction with him at Vasili's cabin, as had been contemplated and expected.

SEPTEMBER 21.—The Chicaloon River was very much lower than when we crossed it in advancing, and evidently was fordable at a point about 2 miles below our former crossing. I had obtained this information the day before, and had the trail blazed down to a point where there was a good ford, thereby saving a half mile. We traveled about 6 miles and arrived at Marshall Creek. Here we found Mr. Bagg, the guide of the Marshall party, who had an excellent lunch prepared. The bread made by him was the best we had eaten on the entire trip. After this we pushed on to Kings Creek, crossed down to Young Creek, and went into camp for the night. The distance traveled was 15 miles.

The weather continued fine; but as the moon changed and the sun crossed the equinox the next day, we confidently expected colder weather. Our stock was safe, however, as Melishe's cabin could be reached in two days' forced marching.

SEPTEMBER 22.—At our noon camp our Indian boy speared a salmon that presented an odd appearance. It was a bright red with a rather exaggerated snout, and all of its tail and fins had disappeared, evidently the result of its attempt to push up the stream to deposit its spawn. It may be needless to add that no salmon in fresh water is fit to eat at this season of the year.

Our trail was very hard and firm, the only impediment to travel being a small amount of windfall and a great deal of brush, consisting principally of the high-bush cranberry and a species of dogwood, both of which grew quite high and

thick enough to interfere with our progress. We passed through, on all of the high ground, an immense amount of redtop grass, which stood very thick and as high as, or higher than, one's head. I was informed that this country extended back as far as the foothills to our right and that all of it was covered with this grass.

When we arrived at Tsadaka Creek we found a very substantial cabin built by the Johnson party, who stated their intention of wintering at this point and starting for the Tanana River in the early spring. They, of course, intended sledding their provisions up to the head of the Matanuska River during the winter months.

SEPTEMBER 23.—The stock was so much stronger from the two days of grain food that we had no trouble whatever in going as far as "The Lakes," 12 miles, before noon.

The footing around and between these lakes was not very good. It seemed worse than when we passed over it on the advance. This route can be made perfectly feasible for a wagon road by corduroying across the marshy places, for which there is ample material close at hand. That portion of the trail which passed through timber was troublesome only on account of the roots of all the trees, which in Alaska seem to grow near the surface and intertwine very badly. Travel over this had the effect of mashing the loose earth from around the roots, which left an ugly network, in many places difficult for stock to pass over. But this difficulty could be overcome with a small amount of work. All of the upland country was of the same nature as that passed through the day before, and the soil equally as good. Our camp was located 11 miles from Melishe's cabin, where we had pitched our first camp on the advance.

SEPTEMBER 24.—The eagerness of everyone to reach their destination was apparent for the first time, and the difficulty was to keep both men and animals from pushing too rapidly over the trail. We were somewhat delayed by the old mule we had so frequently abandoned and that we had picked up the day before at "The Lakes." As soon as he struck the least bit of bog, without any warning he would lie down and look beseechingly at everyone who passed, as though appealing for help. This being denied, he would wait until everybody was out of sight, when he would get up and rush back toward the lake where he had spent so much time alone.

We got him back to the cabin, but his day of usefulness had passed, and his cunning in trying to avoid working was far from a recommendation. We reached camp at 11 a. m. and procured a substantial lunch. I then went down to the station, 6 miles below, to ascertain if any mail had been sent me, but the messenger who had been sent for it had not yet returned.

It is worthy of note that at this time I was shown a wild rose in full bloom, which had been plucked at this cabin on the 16th of September.

At Melishe's cabin I found ten cabins already constructed and several more were being erected. The prospectors evidently had been attracted to this place because it was the point of departure of my trail into the interior. When we left this inlet, the 27th of October, more than twenty cabins were being constructed, and a schooner load of prospectors arrived that day with the avowed intention of locating there. I mention this to illustrate how rapidly small villages, and even towns, spring up in a supposed mining country. No good reason existed for selecting this location as a town site. It was not even the head of navigation in Knik Inlet. From the Indian fishing village, just below the station, which is the head of navigation, a good trail over high ground could be opened to connect with my trail. For these reasons the detachment left there was located at that place.

SEPTEMBER 25.—Moved the command down overland to Knik Station and put them in camp on a high bench near a spring of good water. This was necessary to avoid the high spring tides. I made arrangements with an Indian woman to make some bread from a yeast cake, so the command could have a change from the yeast-powder frying-pan bread they had lived upon for over two months.

SEPTEMBER 26.—I sent a pack train back to Melishe's cabin, with orders to bring down the grain we were unable to move the day before.

SEPTEMBER 27.—We met a party of prospectors who had spent two months near the head of Raven Creek, where they said they had located some claims, and that thus far they had made more than $5 per day per man. They stated positively that the small glacier at the head of this creek could be readily avoided by going around it and over a ledge of rock, and that it was practicable not only for a pack train, but for a railroad.

SEPTEMBER 28.—The steamer *Perry* landed with mail for all the party, and I learned that Lieutenant Learnard had arrived at Tyoonok and had taken charge of the permanent camp. I also received instructions to arrange for the care of the animals and stores that were to be wintered at some point selected in that vicinity. Nothing was said about forage being provided, except enough for the five animals originally sent. On board the boat I met Mr. Jack, who had been up the Sushitna River as guide for the geological party in charge of Mr. Eldridge. He informed me they had not reached the Tanana River by about 30 to 40 miles.

The total distance traveled into and returning from the interior was 672 miles; 347 miles were made on the advance. We included all the windings of the trail and estimated the distance by pacing.

SEPTEMBER 29.—Leaving a small party at the camp to take care of the stock and stores, I took the remainder of the command down to Tyoonok. When we reached there we learned of the loss of a party of prospectors and miners in Turnagain Arm. Three or four of these men crossed the Valdez Glacier, went up the Taxlena, thence across the divide and down the Matanuska River to Knik Station, from which place they took passage in a small sailboat, belonging to a man named Johnson, for Sunrise City. None of the party were saved, and no positive information could be obtained as to the cause of the mishap which resulted in the loss of everyone on board.

SEPTEMBER 30.—We went to Ladds Station by rowboat and found that during our absence the Sushitna River had suddenly risen and washed out practically all of the buildings which Mr. Ladd had erected for fishing purposes. In the flood he lost a whaleboat and the small launch on which my party came near losing their lives when going into Knik Inlet.

OCTOBER 5.—I learned from Mr. Madison, who was guide for Mr. Spurr's geological party, that they had gone up the Sushitna River as far as the first large tributary, the Yedno, thence up this stream to its head waters with great difficulty. From there by a short portage they struck the head waters of the Kuskokvim, down which they went to the store of the Alaska Commercial Company near its mouth. The journey was made in Peterborough canoes, which they unfortunately upset several times, thereby losing all of their provisions. After the party under Mr. Spurr had procured another supply

of provisions at the Alaska Commercial Company's store it was divided into two parties. One turned back up the Kuskokvim for some distance and made a portage across to the Yukon River, thence down that stream to St. Michael. Mr. Madison had just returned to Tyoonok from there on board an ocean steamer. Mr. Spurr took charge of the other party. He mapped out a route through lakes Illyama and Clark, from which, by a short portage of 18 miles, he would strike Cooks Inlet at Kuskatan, where he expected to meet the steamer *Perry* on October 18. Mr. Madison said that the Geological Survey party, who had been ordered to go up the river, thence across the Tanana, down through the Yukon to St. Michael, had reached the last-named place at the time he was there. He also stated that a river vessel had started up the Yukon on September 12, loaded with troops destined for intermediate points and Circle City, and expected to reach its destination. This was all interesting to us in that it indicated that Lieutenant Castner and party would be able to catch a boat down the Yukon at Circle City, in case they met with no accidents and reached that point on the date set.

I inquired particularly of Mr. Madison, and also of Mr. Jack, who was the guide of the Eldridge party up the Sushitna River, as to the adaptability of Peterborough canoes to the exploring work in which they were engaged. Both men agreed that they were too light and too easily injured. Mr. Jack also reported against the adaptability for this service of a steel boat of the same pattern furnished Expeditions Nos. 2 and 3.

OCTOBER 6.—A heavy wind from Turnagain Arm raised a high sea in the inlet. It blew with such force that all of our tents were thrown down. During the night an Indian boat was blown ashore, fortunately without damage. Another boat, belonging to a man named Miller, that was anchored just in front of our camp, dragged her anchor for about 3 miles down the inlet and was wrecked on the beach. Mr. Miller, the owner, had with him as an assistant a man named Melish and an English tourist by the name of Studley, who had been hunting for large game in Alaska. Notwithstanding the nature of the storm itself, which was sufficient to make an ordinary boatman watchful, it was surprising that two men accustomed to the inlet could calmly sleep through such a storm and not be aroused by the dragging of the anchor for a distance of 3 miles.

OCTOBER 7.—Just after breakfast I was requested to render assistance in rescuing the effects of Mr. Studley, which consisted principally of some handsome moose and mountain sheep pelts. They were badly damaged by the salt water. I learned from Melish that the loss to the owner, Miller, included not only his boat but all his provisions for the winter. He had just finished paying for the boat, and depended upon it for maintenance. Mr. Smith, who had gone up the Sushitna River to the Talkeetno, said that several very promising "strikes" had been made upon the Chaniltno River, but little development had been done.

OCTOBER 8.—About midnight the steamer *Dora*, of the Alaska Commercial Company, came into port.

OCTOBER 9.—Having received instructions to send Mr. Kelly by the first available opportunity to report to his regiment—he had been appointed a lieutenant or captain in the volunteer service—I made arrangements to send the geologist of my party and all the enlisted men I could spare down to Vancouver under his charge. My object in doing this was to avoid keeping the men at this point, as the weather was getting cold at night; and as they could give no further service, I deemed it probable they might be of use at Vancouver Barracks. I also met on board the boat Mr. Dal Deweese, of Canyon City, Colo. He had been up the Kenai River to the lake, where he secured some very handsome specimens of moose and mountain sheep, which he intended for the Smithsonian Institution. He said he had taken notes on the country traversed and would gladly furnish me with a map of his route and with pictures illustrating the surrounding country. As the object of my trip to Alaska was to obtain all the information possible of value to the development of that country, I very gladly accepted his generous offer, and transmit the same herewith.

As no further information from the department headquarters had been received as to the disposition of the stock, I decided to take passage on the *Dora* as far as Homer. Here I would meet the mail steamer of the Pacific Steam Whaling Company. The vessel at that time did not come farther up the inlet than Homer.

OCTOBER 10.—I arrived at Homer at 3.30 a. m. and went on board the *Perry*, which was lying at anchor in the bay. In the morning I went ashore and found that Homer consisted

of a sand spit running out into the sea for a mile or two, thus forming a very good and well-protected harbor.

A number of prospectors were located at this point, most of whom were members of or connected with the mining company under charge of Dr. Gunning. I was informed the company had expended considerable money in developing some property there, but obtained no definite information regarding it. On the spit were located seven houses and a tent. One of the houses is used by the company as a sort of hotel. There seems to be no water or wood on the spit, but plenty of coal in close vicinity, at Coal Bay. Although a post office had been located at this point during the past summer, it is not a suitable place, for the reason that during the high spring tides the major portion, if not all, of the spit is covered to a depth of a foot or more with salt water.

After examining the place I again went aboard the *Perry*. We steamed up into the sea for a short distance to what is known as "Coal Banks," where the steamer expected to take on a load of coal as soon as the tide ran out. The banks are located about 10 or 12 miles from Homer, just outside of Coal Bay. The coal lies in seams from 18 inches to several feet in thickness, a number of which appear at different elevations of from 10 to 20 feet apart, in a bluff bank about 200 feet high at that point, and were constantly exposed to view. The upper or exposed strata are not considered of very good quality. The lower the seam the better the coal. The shore shelves gradually at this point, and when the tide is out the best coal is secured. The coal is bright, clean to handle, and is readily broken off, with picks, in large pieces. When dry it tends to break up into cubical fragments, and resembles anthracite very much in appearance, though not in weight. The officers of the *Perry* said they had used it for the past three years and that it burns up completely, leaving a dry, clear ash and no clinkers, and that it is of much better quality than the coal found farther up the inlet. It was certainly very easy to mine, since five men on that and the following day succeeded in taking aboard during the low tide, or during two tides only, 60 tons. This was destined for Sunrise City, to be used for general purposes by the inhabitants during the ensuing winter.

OCTOBER 11.—We again steamed up to the Coal Banks and finished taking on coal. After this we lay at anchor until the following morning.

OCTOBER 12.—We steamed to Saldovia, which is loca the westward of Homer, in one of the best protected h in Cooks Inlet. At one time it was an important t point. The Alaska Commercial Company and the American Commercial Company are now located the was informed that these stores are now kept up as m furnish employment for the agents who have been with respective companies for a great many years as for the which is carried on. There are now located there betw and 100 Indians—men, women, and children. I met he Paul Buckley, who, with some prospectors, had been cr around the Kenai Peninsula. They had located some properties in Port Chatham and Port Dick that will u tionably prove of value. He has been in Alaska for years, with headquarters at Sunrise City, from which he had made several prospecting trips. One of the important was made last year, when, in company with others, he went up the Sushitna River to its head. from this party we obtained such reliable information re ing that stream and its tributaries. He had just fi prospecting a mineral-stained ledge at the entrance to th which promised to give very good results. Although the had been in full view to every passing boat for at least t years, up to this time no one had made an attempt to in gate it. The agent of the North American Commercial pany was the first to take sufficient interest in the mat do so.

OCTOBER 13.—The mail steamer *Wolcott* passed the n of the bay some distance out early in the morning. Sh put into Homer during the night, and at the time we sa was steaming for Ounalaska. Upon my return to Ho learned she had not waited for the mail at Sitka, but h board forage for my command, enough only for the five of stock. No hay had been sent, for some unexplained re After taking on board the grain, the *Perry* pulled out a night for Coal Camp, 12 miles distant from Homer. arrived there early on the following morning, but on ac of the darkness we had to wait for daylight before se the passengers ashore.

OCTOBER 14.—We again reached Homer about noon, we took on board some passengers and steamed for Ty via Kenai.

OCTOBER 15.—We arrived at Kenai about 3 a. m. and were ready to resume our journey toward Tyoonok, but did not start, as a strong northeast wind was blowing down the inlet, which would prevent our landing even if we could reach there. So we decided to lie in the harbor till the storm abated.

In the afternoon we found there a Russian bannya belonging to a fisherman who had located there and married a Russian woman. This bath consisted of a small log cabin about 10 by 12, divided into two compartments. One was very narrow and used as a dressing room; the other, 8 by 10, contained a regular brick furnace, over which hung a large iron pot filled with water. Alongside of this, and so arranged that the fire built in the furnace would heat them, was placed a pile of brick, in an open oven. The method of taking a bath consists in providing oneself with a tub full of reasonably hot water. Then the hot water from the pot is thrown on the heated brick in the open oven till the steam produced raises the temperature to the desired point. A novice does not require very much. After a thorough perspiration is started a regular bath is taken in the tub. Then one returns to the dressing room, cools off thoroughly, dresses and goes as quickly as possible to some warm room. The Indian bannya consists of only one small room scarcely large enough to sit up in. They produce steam by throwing water on a pile of rocks which they have previously heated and piled in one corner, and omit entirely the bath or cleansing part. While still profusely perspiring, they crawl out of the small opening into a cold room where they sit for some time before dressing. Some of them are foolish enough in the winter season to walk out from this hot bath, while in a profuse perspiration, and roll over and over in a snow bank.

Kenai is a very old Russian settlement, the site of an abandoned military post. Located there now is a trading store of the Alaska Commercial Company and canneries of the Alaska Packing Company and Pacific Steam Whaling Company; also an Indian and Russian settlement, separated from each other by only a short distance. In each settlement there are about 100 people.

OCTOBER 16.—We were forced to lie in the harbor all day, on account of the storm. Learning there was to be an Indian dance at the house of the chief, Stephan, that evening, under the escort of Mr. Ryan, the agent of the Pacific Steam Whaling

Company, we proceeded to the place. The dance did n
off, however, as the Indian women discovered that man
men had procured some intoxicants and were nearly all

My uniform attracted the attention of the old ch
pointed by the commanding officer of the Americar
stationed there many years ago, who had proved hir
be worthy of the trust reposed in him. He was nearly
years of age. Some years ago, realizing that he was
to exercise authority, he transferred his scepter to l
The latter does not remain around the station very m
account of inability to agree with the Russian pries
assumed to appoint some other Indian as chief in his
In my conversation with the old chief I had to make
three languages, Indian, Russian, and English. Th
did not understand Russian and Mr. Ryan did not und
Indian.

I found the old chief very anxious to have his peopl
the American language and American ways. He wa
cially interested in the establishment of schools in Cook
His chief interest in this regard centered in Kenai, his
place. He particularly emphasized the fact that the y
Indians should be taught to speak the English lan
After I promised to use my best efforts to see that s
were established, as he requested, he seemed very
pleased and, with the most stately manner imaginable,
toward me, looked reverently heavenward, crossed h
twice, and stated he was most profoundly grateful tha
seen fit to call upon him. He remained in this most cou
and dignified attitude until he was assured his speec
been interpreted and that I understood it. Then he
turned his eyes heavenward, made another profound
and retired to his couch. Although he crossed himse
was anxious I should be informed that he belonged
particular religious denomination, and having reached
when it was but a short time before he would pass aw
churches were the same to him.

After this I made a call upon the second chief, a r
mediocre ability, acknowledging his appointment fro
priests and disposed to be guided by them in everythin
possessed no special qualifications as a leader.

OCTOBER 17.—The storm abated, much to the relief of
one, and the *Perry* steamed into the inlet at high tide,

noon. En route to Tyoonok we stopped at McKinley, formerly called Nakiska No. 2, for the purpose of delivering some mail. At this place a town site had been laid out by a mining syndicate, of whose operations I could learn nothing. The members of the company consisted of the residents of this would-be town.

We arrived at Tyoonok about 5 p. m. On account of the lateness of the season, the steamer *Perry* was unwilling to attempt to move our stock from Knik Inlet to Homer, where I could have arranged for stabling them at an exceedingly small cost. The reason given for refusing was that should a storm come up, which was very likely at this season of the year, the chances of losing the stock would be very great. There was nothing left to be done under these conditions but to leave them at Knik Inlet. I sent Lieutenant Learnard to Sunrise City to purchase all the hay and grain for sale there, in order to ship it to Knik Inlet on board the *Perry*, with the grain received at Homer.

OCTOBER 18–20.—We consumed the time waiting for the return of the *Perry*. From Mr. Hanmore, who kept a reasonably accurate record of the people who came into Cooks Inlet during this season, I learned that 1,225 persons had come in since the early spring, and that about 400 of them intended to winter in the inlet.

OCTOBER 21.—Took advantage of the bright, clear day to row down the inlet for the purpose of examining the outcropping of coal which had been located by a Mr. E. A. White, of San Francisco. Unfortunately, the tide had come in so far it was impossible to get a view of the seams that crop out at low tide, which, as stated in regard to the coal found near Homer, is the best. The bed at this point is about 6 feet thick, easily mined, and will eventually be used by boats plying into the inlet for generating steam.

OCTOBER 22.—It was exceedingly cold through the night, and everyone was shivering in the morning. By 8 o'clock the sun came out and it was more comfortable. The *Perry* came in, and I learned that she had put into Knik Inlet, where Lieutenant Learnard had remained. He purchased but little grain in Sunrise, and was unable to procure any hay. The *Perry* still had the grain on board, not having had time to unload it, but as it was necessary to make another trip to carry our camp equipage and stores, together with

some passengers, everything could be delivered at the same time.

OCTOBER 23.—We loaded all of our freight, and at 4 p. m. weighed anchor and pulled out for the Knik. We had a very smooth passage, and arrived at 1 a. m. the following morning. Our only mishap was to run aground before reaching the station, but the tide still coming in, we were soon lifted off and at our landing.

OCTOBER 24.—In the afternoon the tide turned and we sailed again for Tyoonok, supposing this would be our last visit to Knik Inlet. But when we arrived at that place and were ready to go aboard the *Dora* for home, we were surprised to find the steamer *Rival* lying at anchor. Going aboard, we found she was loaded with hay and grain for my stock. We at once arranged with the captain to steam as far as Fire Island, from which place the *Perry* was engaged to lighter the freight to Knik Station.

OCTOBER 25.—During the night the steamer *Dora* came into port, and arrangements were made with her to await the return of the *Perry*, so the passengers and crew could make sure of transportation to Seattle. After this we steamed to Fire Island and commenced transferring the freight from the *Rival* to the *Perry*. Finding it would be impossible to carry all of the freight in one load, we arranged to make two trips, the plan being to unload as much as possible during high tide and return so as to catch the remainder of the freight on the ebb. The transportation of the grain and hay kept all of my command and the crew busy for forty-eight hours. During this time we were unable to procure sleep, but we were so anxious to finish unloading and get out of the country before the winter really set in there was not a murmur to be heard from anyone. The unloading at the Knik involved wading back and forth through water and mud up to and over the tops of our wading boots.

OCTOBER 26.—Having received instructions from department headquarters to carry all of the relief stores that could be spared with me on board the *Rival* to the camp of Expedition No. 2, at Valdez Inlet, I had the same loaded on board the *Perry* on her last trip, and they were duly transferred to the *Rival* on reaching here. As the tide was against us for a good part of our trip from Fire Island to Tyoonok, we induced the *Rival* to take the *Perry* in tow and saved one full tide.

Reaching Tyoonok about 5 p. m., we remained there for a short time and then steamed down the inlet for Kuskatan, where we were to pick up the Geological Survey party under charge of Mr. Spurr.

OCTOBER 27.—We arrived at Kuskatan about midnight and cast anchor till the following morning, to await the return of the *Perry*, which had put into shore to inquire for the Spurr party.

OCTOBER 28.—We got under way early in the morning, with the *Perry* still in tow. Shortly after starting we ran into a snowstorm, which lasted at intervals throughout the day. About 11 a. m. we encountered quite a swell from the sea that sent all hands below. After this we cut loose from the *Perry*. She was rendered assistance by the *Dora* and not again seen by us.

Arrived at the harbor of Valdez and cast anchor in the small cove across the inlet. Immediately after breakfast we found anchorage near the shore opposite the town of Valdez; went ashore and arranged for unloading the hay, grain, and commissary stores for that place. We found that all of Expedition No. 2 had sailed on board the *Excelsior* several days before. All their property had been left in charge of Charles Brown, the quartermaster's agent. As soon as practicable arrangements were made for the use of a barge to lighter the freight ashore. We consumed the day examining the situation of prospectors who were supposed to be destitute at that point. But from most reliable information I could see no necessity for stopping myself, or leaving any of my party there for investigation, as contemplated in instructions received by me at Cooks Inlet. At this point I found only one horse and one mule. The rest of the Government stock had been sent out to what is known as the "Thirty-Mile House," on the new trail, for the purpose of carrying grain to fifteen head of stock which had been abandoned by the last party coming out. The enlisted men of the command who were with the abandoned stock had passed over this new trail. So far as I could ascertain there was no glacier to be crossed on this route in reaching the interior of the Copper River Valley.

OCTOBER 31.—We arrived at Orca about 2 p. m. The *Excelsior* had sailed several days previous. This being the post office and the mail having come in, I examined an immense mass of it, but found none for our own party.

NOVEMBER 1.—We steamed out of Orca at 7 a. m. From this time to November 6, the date of our arrival at Seattle, nothing occurred worthy of note except that we took what is known as the "outside passage," and therefore saw no other vessel plying between Alaska and Seattle. I was much surprised to find upon our arrival in Seattle that the members of Expedition No. 2 had not yet arrived.

On November 10 we arrived at Vancouver Barracks, Wash., our starting point of more than seven months previous.

SUMMARY.

TOPOGRAPHICAL FEATURES.

The first mountains observed in going to Alaska are the Coast range, that follows along the curve of the North Pacific coast line up to the head of Lynn Canal, where, according to Mr. C. W. Hayes, of the United States Geological Survey, it passes behind the St. Elias range. The latter extends in the general form of a crescent from Vancouver Island, below which it joins the Coast range of Oregon and Washington through the Alexander Archipelago, thence around Cross and Prince William sounds. The western horn of the crescent terminates in the Kenai Peninsula and Kadiak Island. In the central portion of this crescent is the Mount St. Elias group, that reaches an elevation of nearly 20,000 feet.

These two ranges form an almost insurmountable barrier for the prospectors who desire to seek their fortunes in the interior of our Arctic provinces. The average width, or thickness, of each is about 40 to 100 miles. Both are made up of snow-capped peaks, with imposing glaciers lying between practically all of them, and which form equally as serious obstacles to travel as the peaks themselves.

There are but few large water courses breaking through the St. Elias range from the interior. The principal ones are the Sushitna, Matanuska, and Copper rivers.

The first named (Sushitna) rises in the Alaskan range just south of the Tanana River, flows in a general southerly direction, emptying into Cooks Inlet at its head. It is navigable during the open season for something over 100 miles from its mouth, for properly constructed boats. It would probably be more accurate to state that, instead of breaking through the St. Elias range, with the Cooks Inlet it separates this from the Coast range, lying on its north and west.

The Matanuska River, just inside of the St. Elias range, is not navigable, and flows in a general westerly direction parallel to it, cutting off a spur of the range that lies between it and the Sushitna River on the west.

The Copper River also rises in the Coast range of mountains, flows through the St. Elias range, and empties into the Pacific Ocean east of Prince William Sound. It is not navigable, on account of the presence of certain obstacles, such as glaciers and rapids, a short distance above its mouth.

The Matanuska and Sushitna lie directly in the territory I was directed to explore. The former is about 100 miles in length, has a number of tributaries, principally on the west or north side, and passes through a valley with an average width of not to exceed 20 miles. No one of these tributaries carries enough water to be properly termed a river. The valley lies principally on the same side as the tributaries. It is generally upland, rising gradually to the head of the river.

The Sushitna River is about 200 miles long and flows through a very wide and comparatively level or rolling valley. Near the mouth of the river this valley is quite low and flat, with considerable marshy ground. In this portion the vegetation consists of small shrub or brush. But farther up the valley and toward the mountains, on either side, are found some very good-sized trees, some of which will make very good lumber.

The interior of the country, after passing through the mountain ranges, consists of low, rolling hills until the Alaska range of mountains is reached. This portion of Alaska is of the same general appearance as certain sections of our Northwestern States, such as Minnesota, the Dakotas, and Montana. The vegetation is quite different, since the greater part of this section is covered with several varieties of moss that offer a very serious obstacle to travel until a trail has been broken over it. In addition to this moss several varieties of good grass are found. Trees are also found, but they are not so large as those found near the seacoast and in the valleys of the streams mentioned hereinabove. In that portion of this section heretofore described as the "burned district" the grass appeared to be more abundant and of somewhat better quality than where the moss had not been burned off. This was noticeably the case in the valley of the Matanuska River.

The Alaskan range of mountains lies just south of the Tanana River and, considered broadly, is probably a part of

the Coast range, which, like the St. Elias range, has the general form of a crescent, whose western fork runs down to the west of Cooks Inlet and terminates in the Alaskan Peninsula and Aleutian Archipelago. In general features it is quite similar to the St. Elias range, except that there exist many more low, broad passes or openings through it. Many of these are known to be sufficiently low and broad to offer no serious obstacle to travel through them.

The valley of the Tanana River, at the point we saw it—the mouth of the Delta River—is from 20 to 30 miles wide. It was covered with a dense growth of timber of medium size, principally spruce, throughout which was a dense growth of moss. Beyond it, on the northern side, for a distance of 40 to 70 miles (estimated) is a low range of foothills that we assumed to be the Tanana or Ketchumstock range.

The range of mountains between the Matanuska and Sushitna rivers presents the same general appearance as the range along the coast until some distance above the head of the Little Sushitna River, when the peaks gradually become lower, terminating in a plateau near the Chaniltno River.

The Kenai Peninsula, which lies between Cooks Inlet and Prince William Sound, is quite mountainous on the eastern and southern portion; but on the northwestern side there is a comparatively low country of gravel, sloping back gradually to the mountains for a distance of about 40 miles.

The country on the north coast of Cooks Inlet is, in general, very similar to that just described. The distance from the coast to the mountains varies from a few to 70 or 80 miles.

AVAILABLE ROUTES OF TRAVEL.

The only available routes by which one could reach the gold fields of Alaska, or that region of country north of the Tanana River, including the Yukon and its tributaries on both sides from Rampart City to Lake Bennett, and popularly described as the "Klondike" region, up to the beginning of the year 1898 were via the head of Lynn Canal—either through the Chilkoot or Chilcat passes—thence down the Yukon River by boats or dog sleds, depending upon the season of the year, and via St. Michaels, thence up the Yukon by steamer. The objection to the former consisted principally in the fact that as soon as one reached the summit of the mountains back of Dyea or Skagway he passed out of

American into English or Canadian territory, through which he traveled during the remainder of his journey to Eagle City, just below (north of) Dawson City. In passing into foreign territory he was forced to pay duty on everything in his outfit, which to the average prospector was a serious burden.

The only serious objection to the route via St. Michaels was, and is, that the Yukon River is frozen over for nearly nine months of the year, thereby cutting short the time for prospecting during the first year.

To avoid the foregoing objections it was necessary to explore the intervening points on the seacoast of Alaska that presented the most favorable prospects for an opening into the interior of that Territory. Such points must not only furnish a practicable outlet, but this outlet should be from a harbor open during every month of the year, if possible. By previous explorations it had been determined that the Copper River could not be ascended from its mouth; so that if the valley of this stream should prove to be of value as a trail to the interior it must be reached via Prince William Sound, about 100 miles above its mouth. Valdez Inlet was considered as the most favorable point from which to start such an exploration.

It was also known that Cooks Inlet and all points of the coast north of it were frozen over during certain months of the year; but it was believed that from the head of that inlet a trail could be found to the Yukon. The first duty in connection with this work was to find, if possible, a trail from Prince William Sound to the head of that inlet, and the next to find an outlet from that point.

From the best information obtainable, a route existed from some point on Port Wells Inlet of Prince William Sound, and still another from Resurrection Bay, on the east coast of the Kenai Peninsula. An investigation of the former showed that our information was erroneous. But we succeeded in sending a small party over what is reported by Mr. Kelly as being a practicable trail from Portage Bay to the head of Knik Arm, passing Turnagain Arm on the north side. From this report the details concerning this trail can be gathered. It is only necessary to mention here that this route runs from Portage Bay, on the coast, up Cabin Creek, over the divide, to the head of Twenty-Mile River; thence up the west fork

across to Winner Creek; down this to and across California Creek; thence up Crow Creek, a tributary of California Creek, to Raven Creek; thence down it and the Yukla River to Knik Arm. The serious obstacles to be overcome in going over this trail are to be found in crossing the divides. The first one between Cabin Creek and Twenty-Mile River is less than 2,000 feet high, with no reported danger from snow-slides. Nor is there any glacier to cross; but some difficulty may be experienced in reaching the top of it with a satisfactory grade. The distance from tide water to the summit is about 6 miles.

From the foot of the divide on the north Mr. Kelly says: "From Lake Glenn the proper course is westerly, across the main stream (the Twenty-Mile River), then up the right bank of the west branch to the pass, over a comparatively level ground which required the cutting of some brush. By means of a winding trail the ascent and descent of the pass is easy, as timber extends nearly to the top. While the snow was very deep on the summit, we found no glaciers nearer than 2 miles." As to the next divide he says: "I proceeded to the summit of Crow Creek, where I found a favorable pass with fairly good traveling and gradual ascent, the descent on the other side not being difficult to Raven Creek, which runs due north for 7 miles to Yukla River. A trail can easily be worked down the right bank of this gulch."

There is a glacier at the head of Raven Creek, about 2 miles long, which was avoided by Mr. Kelly, who left it to his right. Although this is a comparatively short glacier, it is impracticable to construct a trail over it or any other. This can be avoided, as reported, by passing over the high ground to the south of it.

An investigation of the route from Resurrection Bay to Sunrise City showed that a trail could be constructed to the last-named point. This would be of local value only, since the difficulties in the way of crossing the Turnagain Arm are practically insurmountable, were it not for the fact that, instead of going to Sunrise City, a trail has been found down a creek that puts into the head of Turnagain Arm. From this point the trail would pass up Twenty-Mile River to the west fork, from which point it would coincide with that previously described from Portage Bay.

The Kelly trail should, immediately after passing out of the mountains, leave the Yukla River, turn up the Knik

Arm toward and across the Knik River, thence up the valley of the Matanuska River on the east bank for about 20 miles. Here this stream should be crossed by means of a bridge. At this point it strikes the trail followed by my command in returning from the Tanana River. No obstacles that are insurmountable, or even extremely difficult, will be encountered from this point to the Tanana River. From the head of the Matanuska River this trail crosses the Taxlena River at its head, proceeds thence to Bubb River over comparatively easy grades in a direction somewhat east of north, proceeding thence in the same general direction to the Alaskan range of mountains.

As previously stated, the trail from Bubb River passes along the divide between the Copper and Sushitna rivers, as shown in various ways, but conclusively by the fact that the streams we crossed were very small, flowing from lakes of which there exists to all appearance thousands, and flowed in opposite directions.

After passing through this district my own trail turned somewhat more toward the north; but an equally good trail exists to the Slana River on the east, thence through the Alaskan range, which will strike the Tanana River much farther to the eastward and nearer its head waters. From a careful inspection of the intervening country to the east, there existed not the slightest doubt that Lake Mantasta Pass can be reached readily. The only difficulty will be in crossing the Christachina River, a tributary of the Copper. This should not be difficult, as it was crossed by Expedition No. 2 near its mouth.

Returning to my own trail of last summer and fall, it is only necessary to add that it leads through a very good pass in the Alaskan range that showed evident signs of having been used by the natives from the Copper, Sushitna, and Tanana rivers for an indefinite period. This was apparent from the number of trails we found leading into it. Our time for exploration was so limited that it was impossible to determine whether the trail actually followed by the command was the best that could be found down the Delta River.

From the hurried observations made by us we were satisfied that a route with a lower grade, one, in fact, that would avoid all the heavier grades, could be found down the river a few miles to the east of the trail we followed. In going through

we were following the Indian trail without regard to the surrounding country.

Aside from the few marshy places that can be readily made practicable with material close at hand, aside from the necessity of bridging certain streams crossed, especially the tributaries of the Matanuska that it is advisable to bridge, and aside from the labor required to cut out the number of trees necessary to permit of passage through with wagons or pack animals, no very great amount of labor will be necessary to construct a perfectly practicable trail for pack animals or wagon road from Cooks Inlet to the place where my expedition turned back.

It has been previously stated herein that Lieut. J. C. Castner, U. S. A., with two enlisted men, was sent by me from that point, with instructions to proceed to Circle City, Alaska. This detachment has not yet returned from that Territory. No report has been received from him as to the nature of the country passed over after being detached from my command. A rather extended view of the country in our front was obtained, however, and we could see no serious obstacles to travel over it.

After leaving the St. Elias range of mountains, and during practically all of the time that intervened up to our return to the same point, the rainfall was almost constant. It is fair to assume that the country passed over was seen under the worst possible condition. It is quite certain that all marshy places would be as troublesome as at any season of the year. Only two places had to be repaired before passing over them. The amount of corduroy used for the two did not exceed 30 to 40 feet. This is fairly good evidence of the facility with which a pack train can be utilized in that section of Alaska.

The party that was sent up the Sushitna River did not use pack animals, but relied upon boats to carry their goods up the river as far as the forks, or to the Talkeetna River.

As stated hereinbefore, the intention was to furnish this detachment with pack animals via the head of the Chicaloon and the Talkeetna rivers. In this we failed. But so certain am I that our information, obtained from the Indians, to the effect that a practicable trail for pack animals can be found over this route and from there up the trail followed by Sergeant Yanert, is correct, I ordered him to make a snowshoe trip over it during this winter.

The Sushitna River is filled with islands and sand bars innumerable. In fact, the word "Sushitna" means sand, and the river in English would be known as the River of Sand. Several attempts were made during the past summer to navigate this river with steam launches, but with indifferent success, above the Alaska Commercial Company's store, about 25 miles from its mouth. The small steam launch of the Boston Company, above referred to, managed upon one occasion to go about 5 miles above the station, but was unfortunate enough to break all but two blades of her propellers and was forced to return. The small stern-wheel boat went up quite a distance farther without serious accident of any kind. But her wheel was ridiculously short and her power so inadequate that her failure would imply nothing whatever as to the navigability of the stream. I made diligent inquiry of all persons who were at all familiar with this stream from actual experience, and all agree that a properly constructed stern-wheel boat, with sufficient power to successfully stem the current, or to check herself quickly when descending the river, could navigate it. Not only is the river filled with sand bars and islands, but the channel changes with great frequency, so that the channel followed in ascending will not usually coincide with that used in descending.

In a verbal report upon this subject by Lieut. H. G. Learnard, who had command of the detachment sent up that stream, I learned that he had arrived at the conclusion that this stream was navigable for about 120 miles. The type of boat recommended is a stern-wheeler with a speed of about 15 knots. I have not seen his written report, but I assume that it will express this view. The following extracts from letters addressed to me on this subject by Messrs. W. G. Jack and Paul Buckley, who are the best informed upon this subject of any persons in that section of Alaska, express the situation quite clearly and need no comment:

TYOONOK, ALASKA, *October 2, 1898.*

* * * * * * *

I beg to inform you that in the year 1897 I went up the main Sushitna to the middle fork, and up that to its head. I was accompanied on this trip by eight companions. Our principal object was prospecting. During last summer I went up this stream as guide for the party in charge of Mr. George H. Eldridge, of the Geological Department. On both trips we used small boats and depended upon rowing and cordelling them. In my

best judgment, a properly constructed boat, drawing not to exceed 2 feet of water, can navigate this river (Sushitna) from its mouth as far as the forks, and from that point up the middle fork for a distance of about 37 miles, or to Indian Creek. The only obstacle to be overcome in this fork is a sand bar. This may not exist another season, but during this season it confined the current to a very narrow, swift channel. At no stage of water have I found this river with a channel that did not contain sufficient water to float a vessel of the draft above mentioned. The mean fall in this river from the forks to its mouth is about 3 feet to the mile. In the main fork the mean fall is about 7 or 8 feet to the mile. The current is about the same as that of the Missouri River, or from 4 to 5 miles per hour in the main stream, and probably a mile more in the fork. The difficulty in navigating this stream will be greater in descending than in ascending. The type of boat for this stream must be a flat-bottomed stern-wheel, with sufficient power to enable it to be checked quickly, especially in descending the river. The principal reason for this, aside from overcoming the current and handling readily, is that the channels change frequently and quickly, and freshets bring down a great amount of driftwood in the shape of large trees, which must be avoided. The changes in the channel are so easily, quickly, and frequently made that the same channel used in going up will not be used in coming down on the same trip. The total navigable distance, according to the above, is 119 miles, which a boat would have to travel at least 130 miles to overcome.

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W. J. JACK.

SUNRISE CITY, ALASKA, *October 20, 1898.*

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In regard to the navigability of the Sushitna River, it is my opinion, from the observations I have made in going up and down the river, that it could be boated safely for a distance of nearly 100 miles—say, up to the forks of the river. I should think about a 50 or 60 ton steamer—stern-wheeler—built similar to the Ohio River and Mississippi River steamboats, and drawing not over 2 feet of water, would be the proper boat to go up that river. I came down the river from the head of it in August, 1897, when the river was down very low, and I think a boat similar to the one spoken of would have no trouble in boating from the forks to the mouth.

PAUL BUCKLEY.

No private concern or corporation is likely to undertake fitting out a boat for this purpose until by further development the interior of that section of Alaska is better known, or, in short, until prospecting it shows clearly that business up that stream will warrant the necessary expenditure of money. The evidence is so strongly in favor of this river being navigable for the distance named that the fitting out of a suitable steamer for the purpose is highly desirable, and

such a steamer would greatly facilitate the work of exploring that section of country. The result would be that an exploring outfit could be landed far enough into the interior to make the trip across from Cooks Inlet to Circle City a certainty. The point of landing would be above or through the St. Elias range of mountains. That pack animals could be used from that point certainly as far as the Tanana River appears conclusively from the report of Sergeant Yanert.

A report just received from Lieut. J. C. Castner, from Weare, Alaska, indicates that this trail would reach Circle City via Saljacket Creek, up which the Tanana Indians travel to that city. In addition to all this, should a steam vessel demonstrate the fact of the navigability of this river up to the point named, prospectors would be able to ship their goods to within a comparatively short distance of the most promising gold-bearing section traversed by any part of my command during last season. Finally, such vessel, when no longer needed by the United States, could be readily disposed of in Cooks Inlet without great sacrifice, according to the best information obtainable.

From the report of Sergeant Yanert, who went farther than any other member of my command on the Sushitna route, it is apparent that this route should be further examined during the coming season. The nature of the country from the head of navigation, as far as explored, is in general the same as that traversed by my own party 90 to 100 miles to the eastward. The capability of sustaining stock is certain as far as investigated, and a trail through this section should be established if practicable. The Sushitna Valley and River has been used as a winter trail by the Tanana Indians for years. There is but little doubt that a trail for summer use can be found through this valley. We were not furnished with proper facilities for investigating this section during last season, nor did we procure the necessary animals until it was too late. At that time all detachments were out of reach except the members needed by myself for exploration up the Matanuska River.

Cooks Inlet and the Sushitna River are generally open to navigation from some time in the month of April until some time in the month of October, or about five to six months of each year.

FEASIBLE ROUTES FOR RAILROAD CONSTRUCTION.

The routes described under the previous subhead, "Available routes of travel," cover the only sections examined by Expedition No. 3 that are feasible for railroad construction. These need not be further described under this head; but it can be safely stated that the material necessary for ties, bridge timbers, etc., can be readily procured near the line of road, as can also all the gravel necessary for a roadbed.

The great trouble—in fact, the greatest obstacle for operating a railroad in any portion of Alaska—will be found to arise from the excessive snowfalls on the coast and through the mountain ranges. The snowslides are very numerous through the range of mountains that skirt the coast and occur with great frequency. The amount of snow deposited in the depressions by these slides is almost incalculable. The danger to life and property is not only real, but most serious. In so far as the route from the head of Knik Inlet to the Tanana is concerned this danger is completely eliminated. The same may be said of the route up the Sushitna River. This because the valleys of these streams are so broad that a railroad constructed over either would not pass near enough to the mountain ranges.

In regard to the construction of a railroad up the Sushitna River nothing definite is known, as no one has really attempted to go up the valley of this stream. All travel in the winter season has been on the ice of the river and that during the summer season has been by boat up the stream itself. Such a road, to be of value or available all the year, would have to pass down the west or north side of Cooks Inlet to some point where there is an open harbor throughout the year, certainly as far as Kamishak Bay, or even farther. From all information obtainable a number of obstacles of a serious nature would have to be overcome in passsing down the inlet, rendering the cost of construction very great. In order to pass around the bay at Kuskatan a long stretch of marshy country would have to be crossed. The country between that and Redoubt Bay, in fact for some distance farther down the inlet, is very rough. The country from Kuskatan up the Sushitna is reported to be feasible for a railroad; but it is not sufficiently well known to state anything positively in regard to it.

APPROPRIATE AND AVAILABLE SITES FOR MILITARY POSTS.

Before leaving Portage Bay I set aside a reservation for military purposes in the valley of Cabin Creek, which is on the north side of the bay and about 5 miles from its head. From this point commences Mr. Kelly's trail to Knik Arm. This strip of land is available for military purposes, if needed. It will be advantageous to have troops stationed there in case a trail is established from that point to the interior of Alaska.

I could see no present need for troops in Cooks Inlet, but directed that a certain strip of land be occupied by the detachment left at the head of Knik Arm.

Until there is more development of that country it is impossible to state with definiteness what points should be selected for military posts. So little land in that Territory has been taken up that sites for posts can be selected without difficulty in almost any desired locality.

TIMBER.

There is a large amount of timber that will make good lumber throughout Alaska. The principal varieties of trees growing in the section traversed by my command were the fir, spruce, pine, four or five varieties of cottonwood, and birch. Throughout the Matanuska Valley the birch and cottonwoods predominate, although some spruce and fir are to be found, especially near the mountains, on either side.

In the valley of Cabin Creek, in Portage Bay, there is about 100 acres covered with a dense growth of large trees, spruce and fir, that will make excellent lumber. This is about the best timber actually seen by the command near the coast, although plenty of it can be found in the valleys of all the streams. After passing the head of the Matanuska River, and up to the foothills of the Alaskan range of mountains, the trees are much smaller. In fact, they are quite scrubby. In the valley of the Christachina we found some large fir and spruce trees that would make excellent lumber. In the entire valley of the Delta River trees were found suitable for lumber.

FUEL.

In addition to the trees, there is to be found in Alaska immense deposits of coal. The most extensive of these are found in different parts of Cooks Inlet. The most extensive outcrop of this coal observed by me was in Kachemak Bay, a few miles

above Homer. This I have previously mentioned and described. Above this, and about 2 miles from Tyoonok, there is another outcrop of coal that I made an examination of. It is to all appearances a lignite, but partially consolidated. An examination of it shows that it retains very perfectly the original woody structure. The amount of ash from it is large and contains a number of impurities. Nevertheless, this coal has been frequently used by the steamer *Perry* for steaming. The engineer of that vessel informed me that it was entirely satisfactory for that purpose, although not quite so good as that taken from Coal Point, in Kachemak Bay.

I brought out with me a sample of coal taken from a point about 12 miles directly in rear of Tyoonok, which looks very much like the coal found in Kachemak Bay. In conversation with Mr. Hanmore, the agent of the Alaska Commercial Company at Tyoonok, he informed me that he had traced this seam for nearly 600 miles. This or some other seam certainly crosses Cooks Inlet at one or more places, as one finds large blocks of coal washed upon the beach after each tide has ebbed. This is particularly noticeable after a heavy or severe storm.

Throughout the valley of the Matanuska we found coal of the same general appearance as that found in the inlet, but saw no seams that were large enough to possess any special value commercially. Larger beds were reported, but were not seen by any member of the command.

Near the head waters of the Taxlena other and similar coal was found as float, but no seams were seen by any of us.

Coal was reported by the party under command of Lieutenant Learnard upon the tributaries of Sushitna River, a report upon which will appear in his report, not yet seen by me.

NOTE.--For analysis of the Cook Inlet coal, see Report on Coal and Lignite of Alaska, by William Healy Dall. Government Printing Office, 1896. Pp. 796–7; 828, *et seq.*

MINERAL RESOURCES.

The following is a brief résumé of the mineral resources of the region covered by the explorations of Expedition No. 3 during the summer of 1898, by Mr. W. C. Mendenhall, of the Geological Survey, who was attached to this command as geologist:

"The northern end of Kenai Peninsula and the adjacent mainland are made up of the rocks which yield the gold of the Sunrise City mining district. Thus far development is

limited to placers, and no veins of sufficient richness and extent to justify vein mining have been found. The placer deposits yield up to as high as $120 per day per man, but as a rule are of low grade, and this, with the very short working season, means that comparatively few claims are profitable.

"As a rule, the region outside of a radius of 30 miles from Sunrise has not been prospected thoroughly, and there is still much territory within this radius which is untouched.

"In the valley of the Matanuska and Lower Sushitna, and extending perhaps as far north as the Taxlena drainage, is another gold field of different origin and as yet but little exploited. The rocks are more recent than in the Kenai field, and the gold seems to be associated with a series of basic dikes. From the little known of this field it seems unlikely that it will prove valuable until it becomes possible to work with profit gravel of much lower grade than can be handled with the present economic development of the region.

"Although a belt of well-mineralized schists extend across Delta River, it seems, from the evidence now available, that they are not auriferous, or at least not sufficiently rich to justify expenditure of capital in their development.

"Apart from these areas there are no rocks known in the region examined by the geologist which carry gold.

"Over the greater part of the country, however, a sheet of gravel is spread, largely glacial in origin, which everywhere bears gold in small quantities, and is probably the source of the colors which reward the prospector who washes a pan of gravel along any of the large streams or even on the present beaches. This gold, always fine, always limited in quantity, proves a veritable will-o'-the-wisp to the prospector. It gives him false hopes, and leads him to think that surely he must soon find the source, where the gold is heavy and in paying quantities. He never finds it. In some favored localities these big gravel banks may prove profitable to work by the hydraulic method, but the few efforts thus far made have ended disastrously.

"The gravels occur all about the head of Cooks Inlet, for some distance up Matanuska Valley, and continuously across the high tundra from the northern slope of the Coast range to the southern limit of the Alaskan mountains, so that Delta River takes the source in them and again cuts through them in its lower course.

"Coal occurs in the Matanuska Valley, and rocks which may carry it are found in the upper drainage basin of Taxlena River. The seams examined were thin and therefore commercially valueless, but prospectors report heavier beds at some points, as on Chicaloon Creek and on Coal Creek, a small tributary of the Matanuska, which enters the latter stream from the south bank, opposite the mouth of Chicaloon. Nothing can be said about the quality of these coals, because there was no opportunity afforded for personal examination.

"The 4-foot bed of lignite which occurs in the beach bluff a few miles below Tyoonok is but partially consolidated, retaining very perfectly the original woody structure, and, because of the high ash and other impurities, will never have other than a purely local use.

"No coals and no rocks likely to carry coals were found north of the Coast range."

It is assumed that the mineral resources of the Sushitna Valley will be treated by Lieut. H. G. Learnard, Fourteenth Infantry, who under orders had command of the detachment exploring the region, and whose report has not reached me.

PRODUCTS.

Along the seacoast of Alaska two very important elements enter into and have a controlling effect upon the growth of the cereals and vegetables cultivated. The first is the Japan current, that flows past the entire coast from a short distance above Cooks Inlet, and the other is the amount of sunshine during the summer months. During the months of May, June, July, and August there is scarcely any part of the day when it can be said to be dark. Either the sun is shining or there is twilight.

As all vegetation grows much more rapidly in northern than in the southern climates or toward the Equator, it is but natural that we should expect to find that some of the cereals and all of the hardier vegetables do well in Alaska.

The Department of Agriculture has been making experiments for several years past in the vicinity of Sitka, and intend during the coming year to extend this work to other points, including at least one station in Cooks Inlet. I am indebted to Prof. C. C. Georgeson, who is in charge of that work, for the following information as to the result of experiments last season, viz:

"VEGETABLES.—The climate and soil were favorable to the growth of all the vegetables tested except spinach and wax beans. These two crops were a partial failure, although both could be used. All vegetables in the following list were grown on old ground, in Governor Brady's garden, with the exception of the cabbage, which was transferred to Japonski Island. Vegetables planted on new ground were failures because of the acidity of the soil. Asparagus (white mammoth); wax beans (three varieties); beets (three varieties); cabbage (three varieties); cauliflower (two varieties); carrots (two varieties), which were seeded on May 23; cress (one variety), which by the end of July had all gone to seed; kale (one variety), transferred to Japonski Island in the same manner as cabbage, and produced a good crop by the end of October; kohlrabi; lettuce (three varieties); mustard (yellow California); onions (white Portugal, mammoth, silver king, extra early red flat, yellow Danvers, and top sets—the last-named doing well); parsley (triple curl), this valuable vegetable for soups and dressing meats producing an extra growth; parsnips (hollow crown), which likewise did wonderfully well; peas (twelve varieties), all of which grew well and were fully as productive as those in any part of the States; radishes (French breakfast, early scarlet, turnip, white tipped, olive shape, and long scarlet)—nowhere do vegetables grow better or produce crisper roots than do all these varieties; rutabagas (three varieties, all of which grew as well as they would anywhere); rhubarb (Victoria), which is one of the vegetables which has long been cultivated in Sitka, and a few plants can be found in nearly every garden, where they continue to grow from year to year without any further care than that of gathering the stems when wanted for pies; salsify (large white); spinach (two varieties), the seed of which germinated, but for some unknown reason only a very few of the plants amounted to anything; sage; thyme, the seed of which did not germinate well, but a few little plants were produced ready for transplanting next year; turnip (three varieties), which grows better in Alaska than anywhere else and better than any other vegetable, its roots attaining a phenomenal size in a very short time; windsor bean (large English), this star and hardy bean being planted in poor, sandy soil, nevertheless the plants attained a height of from 3 to 4 feet, and produced an abundant growth of well-filled pods before frost.

"Besides the above lists of vegetables some potatoes planted, which produced a very good crop, but not so as I have seen in many other parts of Alaska. They planted on a knoll of new and poor land. The potato i of the crops that can be depended upon in all parts o Territory. It is grown by the white people everywhere frequently they have no other vegetable. During the years the more enterprising of the Indians have quite g ally raised a patch of potatoes. Those which I saw gro in good soil about Sitka were of excellent quality, mealy of good flavor."

Substantially the same kinds of vegetables were grov Skagway, but with not quite so good results, as the gr was new, raw, and had not been exposed to the sun's ray an extended period. It was necessary to remove a cov of moss, rotten wood, and similar vegetable débris before l able to plant. Also at Juneau, and in the following-n places in Cooks Inlet, viz: Kenai, Ninilchik, Tyoonok, I City, Ladds Station, and on Kadiak Island.

Reports to the Department of Agriculture show that results have been obtained at Pearl Island; Nushagal Bristol Bay; Unalaklik, on Norton Sound, and at a poi the interior 300 miles from the mouth of the Yukon, w the season was so short that all vegetables sown did not mature; but the Early Rose potato yielded 200 bushels t acre, turnips grew to weigh over 5 pounds, and rutaba cabbage, cauliflower, beets, carrots, celery, parsley, rhul and lettuce did well.

Experiments that have been made with the cereals by Department, and by individuals with whom I converse Cooks Inlet, indicate that oats and barley will not only ture, but will give a heavy yield to the acre. Not suffi experiments have been made with wheat, but success in ducing this in Cooks Inlet is certainly very problematic account of the shortness of the season. There is but doubt that buckwheat and flax will do well in certain of Alaska, where the soil is properly selected and prep Nearly all varieties of clover have been experimented successfully.

I am satisfied, from a careful examination of the vall the Matanuska River, that a very large acreage can be dev to agriculture. The upland throughout this valley, as f

the Chicaloon Creek from a point just above Fire Island, is very good soil. This soil extends as far back from the river on the north as the mountains, or has an average width of something like 20 miles. In this district not only was the soil quite rich, but there was every indication of a season sufficiently long to permit of raising everything heretofore grown in and around Sitka.

There is found growing wild in all parts of Alaska visited by me a variety of berries, such as strawberries, raspberries, huckleberries of several kinds, moss berries, marsh berries, currants, high-bush and low-bush cranberries. It is a favorite remark made by the residents of that section that every berry growing in Alaska is not only safe but good to eat.

Among the vegetables growing wild in Alaska I noted specially a wild celery, that the Indians constantly make use of for food; and members of the command ate it with relish while in the interior.

CAPABILITY OF SUSTAINING STOCK OR ANIMALS OF ANY KIND, AND THE ANIMAL BEST SUITED FOR SERVICE IN THAT COUNTRY IN WINTER AND SUMMER.

From what has been said under the previous heading concerning the raising of cereals, it is evident that both horses and cattle can be wintered in that country; and the results accomplished with pack animals in going into the interior, where they lived solely upon the grasses of the section passed over, indicate that both horses and mules can be readily and safely used for draft or pack purposes during the summer season. Not enough attention has been paid to raising of oats, barley, or the clovers, as yet, to depend upon local production for the use of stock during any part of the year. Should enough of these animals be imported into that section to warant it, there is but little doubt that parties can and will be interested in producing the desired food. Excellent hay can be cut in many parts of Cooks Inlet, as well as at some points in the interior.

Not having had sufficient experience in traveling in that section during the winter months to form a positive opinion upon the subject, I hesitate to state what animal would be best suited for use during that season of the year. Both reindeer and dogs have been and are used by those who travel in Alaska every winter. The Indians in and around Cooks Inlet, and all of the natives with whom I came in contact from

the interior, make use of dogs. As the moss and other food consumed by the reindeer grows in abundance in that section of the country and the caribou abound—they are almost identical with the reindeer in shape, habits, and general appearance; in fact, some wild reindeer are actually found—no good reason is apparent why these animals should not be made use of for transportation during the time that snow is upon the ground. I understand that these animals require cold weather, and are not of much value for packing or hauling during the summer. This is true also in regard to dogs.

Summer transportation resolves itself, therefore, into either packing or hauling with the horse or mule. Our experience with the two—we had both in each train—led us to choose the former mainly for the reason that, having larger feet, he can pass over soft ground much better than the mule.

In concluding this subject I wish to state that I am quite positive the grasses in that portion of Alaska through which I passed are of such quality and in more than sufficient quantity to warrant shipping cattle for the Yukon mining district overland from the head of Cooks Inlet up the Matanuska, thence across the trail followed by my command. Not only will beef cattle go through that country safely, but they should and would fatten on the road over. I had employed as a packer with the command a practical cattleman. He assured me, after carefully examining the country passed through, that the foregoing statement was a conservative one. To make such trip a success the stock should land at the head of Cooks Inlet (Knik Arm) as early in the month of May as practicable and be sent across with easy marches, so as to arrive at Forty-Mile by the middle of August or before; this in order to prevent danger from eating frozen grass after the 25th of August.

The animals lost by my own command, and doubtless those lost by Lieutenant Castner after leaving me at Camp Separation, were more affected by eating frozen grass than anything else. It is true Lieutenant Castner attributes the weakness and subsequent death of his two mules to being chilled while crossing the Tanana River; but their actions, as described by him, correspond so nearly to the actions of those lost by myself, which had not been subjected to such cold baths, that I do not doubt my inference as to the cause of their death is in the main correct.

THE NATIVES.

Located in Cooks Inlet are a number of Indians and Russians. The last named are to be found principally at Ninilchik and Kadiak Island. These are largely half-breeds, and at the first-named place I was informed that they are principally descendants of a Russian woman who was captured by the Indians from Yukutat many years since, when all of the inhabitants of that place, with this single exception, were killed. These people do not possess the confidence of the Americans located in that section. On the contrary, they are said to be deceitful, trifling, and lazy, with a strong and almost ungovernable desire to steal and to lie. Those with whom I came in contact were also cowardly in the extreme.

It is but natural that these people should inherit some of the worst traits of the Indians from whom they are descended. It is quite certain that up to within the last few years all of the Indians in that section were considered light-fingered. Such is not the case now, in so far as the coast Indians are concerned. The representatives of the different trading companies have bent their best energies toward breaking up this tendency, and with such marked success that one can now leave his house or tent containing his belongings unlocked at all times with perfect safety. Furthermore, when an article is lost by anyone and is subsequently found by one of these Indians, it is practically certain that the owner will find it in the possession of the agent, to whom it has been handed by the finder, knowing that he will be suitably rewarded for so doing.

I shall make no attempt to classify these Indians into tribes, as this has been done repeatedly by those who have made them a special study. It is sufficient for my purpose to state that the general characteristics of all the Indians on the coast are much the same.

They are all of rather small stature, with features very similar to the North American Indian, especially as to the high cheek bones. Among those located in Prince William Sound were some who had a decided Japanese cast of countenance. They are, as a general rule, quite indolent, depending largely upon hunting and fishing for a livelihood. I was especially struck with their indolence during the fishing season. Instead of providing themselves with all the fish needed for winter use, they idle away their time principally in sleep, varying it with an occasional repast of fish.

I saw enough fish thrown away at Ladds Station, perfectly good for food, or eukla—which is the dried fish—in two or three catches, from the tidal fish trap, to have supported all the Indians located at that station during the entire winter. All that was necessary for them to do was to gather it up and dry it. Yet they did not attempt to save one. In addition, they were too indolent to gather up anything like a sufficient number of the candle fish that appeared in such countless numbers, on the beach even, during the season of their run.

The ease with which the natives of Cooks Inlet can obtain their living is most remarkable. It reminds one of the Divine provision made for the Children of Israel in their wandering through the desert, when the Lord provided manna sufficient for each day's consumption. In the case of these Indians the fish are so abundant that the waves actually wash them on the shore, where only a few minutes of each day is required to gather more than a sufficiency. Besides, the same waves wash upon the same beach coal in abundance, not only for present needs in cooking, but for future use during the cold winter months. And yet, as above stated, they are too lazy and indolent to gather it.

It is true that many, if not all, of these Indians can be made to work. Some of them do work, but the rule at present is that they work only when hungry. The time has now arrived when some attention should be devoted to all of the Indians located in Cooks Inlet by the United States. They can not much longer depend upon hunting for a livelihood, as the fur-bearing animals are fast becoming extinct, and the same is true of the game. Then, too, if the fishing business is carried on in the future as it has been in the past, this source of supply will be cut off in much the same way. I do not for one moment advise that they should be supported by the Government, as this policy would result in their remaining improvident and shiftless for all time, but they should be taken charge of to the extent that they should be required to provide themselves with their usual food so long as it can be obtained.

They should be taught also something about agriculture, and made to follow it to a sufficient extent at least to provide against starvation. Schools should be established at the different points where the natives, both Indians and Russians,

are collected in sufficient numbers to warrant the services of a teacher. In these schools they should of course be taught and made to speak the English language. Schools could be advantageously located at the following points, viz, Kenai, Tyoonok (this would accommodate the few now living at Ladds Station), Sushitna Station, and Knik Station. No schools have ever, in so far as I could ascertain, been located in Cooks Inlet. When so located, every child should be required to take advantage of the facilities offered.

Some capable person should be placed in charge of all the Indians in that section of the country, with absolute power to control them. Until thoroughly established the person designated for this work should be an officer of the United States Army who possesses the required qualifications. No great amount of discipline will be required in controlling the children in that section. I saw them constantly at play with each other during my stay in the inlet, and not once did I see a quarrel of any kind among them. They were at all times laughingly good-natured and very considerate of each other. So striking, in fact, was this that it was noted as being worthy of emulation by many American children I have seen.

Notwithstanding the fact that the Russian priests have endeavored to instill into the minds of these natives a hatred and distrust of the Americans, it is gratifying to be able to state that their success has been rather indifferent. All the natives with whom we came in contact displayed the most kindly feeling toward prospectors and others who visited Alaska. This fact is specially noted by Lieutenant Castner in speaking of the Tanana Indians, who unquestionably saved the lives of himself and party.

In concluding this report it affords me great pleasure to state that each and every member of Expedition No. 3 performed the arduous duties devolved upon them in their several capacities to my entire satisfaction. I feel very much indebted to them for the loyal support and assistance rendered me on all occasions. The work performed by the command was in a new and difficult field. For the greater portion of the time we were forced to perform this work under unusually trying circumstances and without proper facilities, entailing not only personal discomforts but considerable risk.

I wish especially to mention the services performed by Privates Adelbert L. Canwell and George W. Von Schoonhoven,

[illegible] Corps, United States Army, the former for the coolness and good judgment displayed in his attempts to rescue from drowning one of the animals in crossing King Creek, Alaska, and also for his daring in fording Glacial Creek, a tributary of the Delta River, and compelling his Indian to follow, at considerable risk, when carrying important dispatches for myself.—Lieut. J. C. Castner, U. S. A.

The journey performed by Private Von Schoonhoven from the mouth of Bull River to main camp at Melishe's cabin has been previously referred to herein, and is worthy of special commendation in that it involved extreme hardships, entailing great personal suffering on his part and that of the Indian who accompanied him. This journey was performed practically without shelter of any kind, through snow of considerable depth, and resulted in the saving of the pack animals that wintered.

I wish also to call special attention to the services performed by Sergt. William Yanert, Troop K, Eighth United States Cavalry. The journey performed by him, under the immediate direction of Lieut. H. G. Learnard, Fourteenth United States Infantry, from the Chinaltno River up and into the pass, as per report herewith appended, in which he proceeded in advance until all of his provisions were exhausted and was forced to return the entire distance without food, except such as he procured with his rifle, is worthy of special commendation. I noticed also that the Sergeant was at all times careful and accurate in noting the general features of the country, and his maps submitted stamp him as an unusually good topographer. He was and is especially well equipped for the work to which he had been assigned. His judgment is good, his command of men under him excellent, and his sphere of usefulness should be extended by recognition of his work and capacity as a soldier. In a word, he is well worthy of and has fully earned a commission as an officer of the United States Army.

Private Sam. L. Jones, Company D, Fourteenth Infantry, accompanied Sergeant Yanert and shared the hardships of the journey cheerfully and willingly with him.

The results of the excellent work done by Mr. (now Captain) Luther S. Kelly in discovering the trail from Portage Bay to the Knik Arm, as shown by his report herewith appended, will, it is hoped, prove of lasting benefit to the people of the district through which he passed.

I am also much indebted to Mr. H. H. Hicks for his valuable services as guide to my expedition. I found no one in Alaska more competent, intelligent, and reliable for the duties he was called upon to perform.

The duties performed by Lieuts. H. G. Learnard, Fourteenth United States Infantry, and J. C. Castner, Fourth Infantry, are duly set forth and appear in their reports. The hardships endured by them do not appear, nor does their loyalty, interest in, and willingness to perform each and every service. As to these, I wish to testify and express my thorough appreciation thereof.

Finally, I desire to express my thanks for and appreciation of the service performed by Mr. W. C. Mendenhall, of the United States Geological Survey, who was assigned to duty with Expedition No. 3 by his Department. Every opportunity for obtaining information was eagerly sought and accepted by him. He was at all times enthusiastic in the performance of his work and most willing to render every assistance which by his technical education he was competent to give to the commands he accompanied.

I am specially grateful for his courtesy in performing the topographical work of the expedition conducted into the interior by myself, and in recording the same upon the map submitted herewith. This was no part of the duties he was expected to perform.

Very respectfully, your obedient servant,

EDWIN T. GLENN,
Captain Twenty-fifth U. S. Infantry,
Commanding Alaska Exploring Expedition No. 3.

REPORT OF LIEUTENANT H. G. LEARNARD,

Fourteenth Infantry, U. S. A.

VANCOUVER BARRACKS, WASH., *February 14, 1899.*

TO THE COMMANDING OFFICER EXPLORING EXPEDITION NO. 3,
Washington, D. C.

SIR: I have the honor to submit the following report of the trips made by me while in Alaska serving with Alaska Exploring Expedition No. 3, from April 20 until October 1, 1898:

Pursuant to instructions, I left the main camp at Portage Bay the latter part of April, and proceeded across the glacier at the head of the bay and about 1 mile beyond the head of Turnagain Arm. The party consisted of Mr. Wallace Howe, a civilian employee, Private Matlock, Company D, Fourteenth Infantry, and myself. Two other soldiers were taken as far as the summit of the glacier to assist in pulling the hand sled to the top of the glacier. The glacier is 4½ miles wide. The highest point crossed had an elevation slightly less than 1,000 feet above sea level. The grade from Portage Bay side is very steep in places—so steep, in fact, that most of the miners used a block and tackle to get their supplies to the top of the first bench. After that point is reached the grade is not steep, and the summit is reached about a mile from the beginning of the glacier. The foot of the glacier is about three-fourths of a mile from salt water on the Portage Bay side, and no difficulty was encountered in reaching that point. From the summit the grade is very gentle. After leaving the glacier the trail enters a valley about 2 miles wide, through which flows a stream from the glacier to Turnagain Arm, about 7 miles from the foot of the glacier. Turnagain Arm, a bay of Cooks Inlet, has several streams flowing into it at the head; all but one, marked Quartz Creek, having glaciers at the head of or on tributaries. Turnagain Arm, at the head, was full of stranded cakes of ice at the time of our arrival. Camp was made the first night about 2 miles from Quartz Creek, among some

stunted spruce trees. The following day I went to Quartz Creek and there found 200 miners encamped, all bound for Sunrise City, about 15 miles west of Turnagain Arm. Most of them were new men and knew nothing about Alaska prior to coming to it; but among the boat crew were a few old residents, and from them I learned that no one knew of a way to get to Knik by way of Twenty-Mile River, and all considered it impracticable because of the mountains between the two places. However, every one recommended Mr. H. H. Hicks as the best authority on the country along the Matanuska River and the Knik River, and if information about the Sushitna River was desired, then Mr. Jack was the man to see, as he had made a trip up that river the preceding summer. Neither of the gentlemen referred to was then at Quartz Camp, and no one knew when they would be there.

While at Quartz Camp it was ascertained that a poor trail existed from there to Sunrise along the beach, and that in the summer time there was a pack trail up Quartz Creek and then down a tributary of Six-Mile Creek. The usual way to go from Quartz Camp to Sunrise City is by boat, but the boatman should understand Turnagain Arm, as the water of that bay is very treacherous. Turnagain Arm has a bore tide, which, with the so-called tide rips, makes it extremely dangerous for a small boat, even with no wind blowing. The arm is full of quicksand, and when the tide is out it is nearly bare. There is said to be a difference of nearly 60 feet between extreme high and low tides.

I returned to the camp of the day before and found some trouble in reaching it, because the snow had become so soft that traveling upon it was very difficult.

All the streams flowing into Turnagain Arm at its head have valleys from 10 to 20 miles long and from 2 to 4 miles wide, but, with the exception of the valley of the stream flowing along the trail, all of them were filled with swamps, as far as could be determined.

I then started back to the main camp, but when we reached a point about a mile up on the glacier the party under command of Corporal Young was met, bringing the instructions (hereto appended and marked "Exhibit A") for me to return to Turnagain Arm and try and find a route to Knik by way of Twenty-Mile River, or some stream at the head of the arm. The members of Corporal Young's party were nearly

exhausted when met. They had had breakfast at 4 in the morning, and, as they expected to reach camp early in the day, had not cooked anything to eat on the way, but they met with difficulty. It was then 12 o'clock, and it would take at least two hours to reach a camp. I gave them such cooked rations as my party had and then started for the first timber, some 4 miles away, to make a camp for the day. This point was reached about 3 o'clock in the afternoon. Their progress was slow, as there were but two men to each heavily loaded sled. The next day camp was moved about 4 miles to the head of Turnagain Arm and made in a grove of fair-sized spruce trees.

Two soldiers were sent back, as soon as the rain and gale of wind of the past two days ceased so that traveling was safe, with a report of the condition of the party, written while I was suffering from snow-blindness.

As the snow was melting very fast, and as nothing could be accomplished under the present conditions, I decided to return to the main camp after the receipt of your letter of May 5. Before returning, however, I had sent Mr. Howe and two soldiers up Twenty-Mile River to ascertain the conditions. They returned about 4 o'clock, having been gone eight hours and having been unable to ascend that river but 4 miles. They all reported that the valley of this river was nothing but a swamp and that at present it was impossible to ascend it. A party of hunters who had been up that stream about 15 miles stated to me that it was too late to try to go up there until after the snow had gone, and that then a boat would be needed, as the valley of the stream was an almost impassable swamp. While at Quartz Camp I was informed that Indians at times go from a point opposite Sunrise City to Knik, up one of the streams flowing into the arm. While there I learned that among some of the boatmen there was a disposition to charge a Government employee more than any other person.

On May 7 I started for the main camp, leaving two soldiers to guard the property. The returning party consisted of nine men, who for baggage had their bedding and one sled, but, while a start was made at 4 o'clock, camp was not reached until 12, by which time everyone was thoroughly worn out. Most of the snow had disappeared from the valley, and it was very soft on the glacier. A snowslide had recently slid across

the trail on the Portage Bay side, and some apprehension was felt while passing through the short canyon at the foot of the glacier. Snowslides were of almost hourly occurrence on the mountains in the vicinity of Spruce Camp, the season there being much further advanced than at Portage Bay.

If the party had reached Twenty-Mile River about two weeks earlier, it would have been possible to have gone up that river on the snow with comparative ease.

On May 30, 1898, a party consisting of Mr. Mendenhall, a member of the United States Geological Survey; Mr. Bagg, a civilian employee, and myself was landed at Resurrection Bay, with orders to go to Sunrise City, Alaska. A start was made on the morning of the 31st of May, each member of the party carrying in a pack on his back the necessary bedding, his proportional share of the cooking utensils, ten days' rations, and such other personal articles as desired. The packs averaged 60 pounds at first, but grew lighter each day.

There are four or five houses at Resurrection Bay, occupied by Indians or squaw men, who at the time of our arrival were busy planting a few potatoes and some hardy vegetables in small gardens. A small boat was secured to land the party at the head of the bay, distant about 4 miles from the place of landing for steamers. The head of Resurrection Bay is quite swampy, and has several small streams flowing into it. A trail used by miners going into the Kenai Peninsula this way was soon struck and followed up, and in about half a mile from the starting point it developed into a poor road. This road has been constructed by a California mining company, under the management of Mr. Shackelford, at the expense of a great deal of time and labor, for the purpose of hauling in their mining stores this way. The road followed up Salmon Lake or Creek, ordinarily a small stream, but at this time much swollen from melting snow and ice. The grade was in all cases gentle as far as Salmon Lake, at that time the terminal point.

During the first day much inconvenience was experienced in fording the creek, the water of which was icy cold, waist deep at times, and frequently swift. The road frequently crossed from one side to the other, necessitating considerable fording.

A camp for the first night was made about 2 miles south of the lake, at the mining company's camp, where we were well treated and for which we were under many obligations.

The following morning a start was made, and after traveling about 2 miles we came to the end of the road, and crossing the creek took the ridge on the west bank of the lake. The route was quite rough as far as the head of the lake, but not so much so as to prevent the construction of a good wagon road with small cost.

From the head of the lake a trail led over the divide and down to the small lake shown on the map. The divide had at the highest point an elevation of 1,200 feet above the sea level, which was an increase of 800 feet over the level of the first lake, all in about three-fourths of a mile. In one place the grade was so steep that everyone was glad to have the assistance of a rope, placed there for that purpose. A better grade could be found by taking time to look for it. At the foot of the lake, on the north side of the divide, some miners were found encamped, among whom were other members of the California Company.

On the summit of the divide, and on the north side of the same, plenty of snow and ice was found, while on the south side very little of either was seen. Camp was made for the night at the lake on the north side of the divide, under large spruce trees, and while a small amount of rain fell, no inconvenience was experienced because of the thick foliage of the trees. Because of the weight the party took no tents. Fortunately, rain fell but once during the entire trip.

The next morning, having proceeded to Snow River, part of the way on the ice of one of the lakes and over the snow, we embarked in a dory with the owners, Messrs. Roble and Stetson, and a man named McCrea. A good trail could be constructed from the divide to Snow River with little trouble.

The current in Snow River was very strong and the descent was made in about two hours, or at the rate of 6 miles an hour. The stream has a glacier on it about 10 miles above the point where the trail struck it.

The river flows through a valley several miles wide, limited on the east side by a chain of mountains about 3,000 feet high, although some peaks have an elevation of over 5,000 feet. The river has several shallow rapids, one or two of which came near upsetting us, and once when we got out of the main channel and ran into some driftwood the boat almost upset.

The river contains many small islands, and in consequence the amount of water flowing through any one channel is not great, while if it was all confined in one channel it would make a good-sized stream.

About 12 o'clock Lake Kenai was reached, where a stop was made for dinner at a log cabin built recently by miners. Several miners started down the lake in a sailboat and on rafts as we arrived.

Before starting down Lake Kenai a small sail was rigged on the boat, and as a good, fair wind was blowing the first 6 miles were sailed in about an hour. The dory was loaded down to within about 6 inches of the water, so that we could not stand a heavy blow. On rounding the first turn the wind died out for a while, but the small island in Lake Kenai, named Porcupine, was reached about 4 o'clock. After making a short stop there we proceeded down the lake, arriving at a camp about a mile beyond Quartz Creek about 9.30 in the evening, having stopped on the way to shoot a brown bear seen on the mountain, which delayed us about two hours.

It is very doubtful if a wagon road could be constructed along the shore to Lake Kenai, because the mountains in several places rise straight up from the lake, and then snowslides are very frequent in places, many of which come down on the lake. Great swaths were cut out of the timber on the mountains by the slides which have taken place in the past.

The mountains are very rugged and broken, and have an average elevation of about 350 feet. Besides the glacier on Snow River, I was told that there were glaciers on Cooper and Trail creeks or tributaries. So much glacier water flowing into Lake Kenai discolors the water, causing it to have a whitish appearance.

Kenai Lake is about 30 miles long and has a width varying from 1½ to 2½ miles, although at the bends it has a much greater width. It is reported to be very deep, and lying between mountains, some of which rise straight up from the water's edge, this report would seem to be confirmed. The scenic effect along the lake is very fine and grand, but at places very desolate and dreary, especially where the mountains are so steep and barren that even grass and bushes will not grow.

Mr. Roble said that a trail up the creek marked Trail Creek and then down a tributary of Six-Mile is occasionally used,

but that generally in the fore part of June there is more snow there than on the trail up Quartz Creek. The pass he described as being low and not difficult of approach. Mr. Stetson said that there was a pass up the creek marked Juno Creek on the map, and after crossing the divide the trail led down a tributary of Resurrection Creek to Hope, a small mining village about 10 miles west of Sunrise City.

We were much indebted to Messrs. Roble and Stetson for passage down Lake Kenai. If we had been compelled to make our way on foot along the shore it would have been almost impossible.

From what one could see on the way down Lake Kenai, there were low gaps between the different peaks. This seemed to be quite characteristic of all the mountains I saw in Alaska. Kenai River flows out of Lake Kenai and then through Lake Skillakh, which was stated by men who had been to it to be about 60 miles long. From the latter lake the river flows into Cooks Inlet, near old Fort Kenai. Small boats have descended the river in safety, but I have been informed that there are very dangerous rapids on it, and that several men who were not acquainted with the river have lost their lives while trying to descend it.

The next morning after arriving at Lake Kenai Mr. Bagg and I continued the trip toward Sunrise, while the balance of the party, including Mr. Mendenhall, who wished to examine some gravel banks at Juno Creek, continued on down to the foot of the lake, where some mining operations were in progress. A trail leading up Quartz Creek was struck about a mile from camp and followed, but it was very poor, because of the fallen timber, moss, and the soft nature of the ground, as it led along the banks of the creek.

Quartz Creek flows through a valley about 2 miles wide at the mouth, which valley gradually grows until about 8 miles up, where it ends in a narrow canyon. The creek is very swift, but narrow, and does not carry much water. It is of no importance unless mineral wealth should be found in it or its tributaries. Probably a better trail could be located than the one we followed by going up on the bluffs along the valley of the creek, where the timber had been burned off.

At the canyon it was necessary to take the high ground several hundred feet above the level of the creek, and to do

so one had a very steep grade to overcome, which Mr. Mendenhall said could have been avoided by taking the high ground sooner. About a mile beyond the beginning of the canyon Gulch Creek flows into Quartz Creek through a deep canyon. This stream is full of rapids, and, because of its swift current, unfordable. We experienced some difficulty in crossing it, but Mr. Mendenhall, who crossed farther to the west, reported that he had found a very good place to cross.

About a mile and a half beyond Gulch Creek the trail followed close to Quartz Creek and on very level ground. From there on a very good trail of road could be constructed without difficulty as far as Mills Creek, with the exception of a short distance along the upper lake, at which point the mountains rise close up to the banks of the lake. Snowslides would bother some along the lake, but probably the greater portion of the season when these occur danger from them can be avoided by traveling on the ice on the lake.

The divide between Quartz and Canyon creeks was so gentle that the first sure sign that we had crossed the summit was when the water was seen flowing to the north instead of to the south. For about half a mile on each side of the divide there was a good-sized marsh, which reached nearly across the pass, about 1 mile wide on the summit. The summit had an elevation of about 1,450 feet, which was nearly that of the timber line. The second camp from Lake Kenai was made at the first lake beyond the summit of the divide.

From Lake Kenai to the summit the country was well timbered, but from that point to Mills Creek there were many open patches, and the timber was smaller than on the other side of the divide, probably due to the fact that one had a southern slope while the other had a northern.

At the junction of Canyon and Mills creeks there are several cabins, some mining was going on, and there was a pack-train trail to Sunrise City. Two trails to Sunrise City leave the upper fork, one on the east side and the other on the west side of Canyon Creek. We started to follow the trail on the west side, but after following it about 3 miles it crossed to the east side, and the trails ran together from that point to Sunrise City. The lower fork, or the junction of Canyon and Six-Mile creeks, was reached about 9 o'clock in the evening. The trail between the two forks is scarcely worthy of the name, for while it is true that pack animals with loads do travel over

it, yet there are places on it that a man can only get around with difficulty. The greater part of the way the trail is along the side of the mountain several hundred feet above Canyon Creek, and in many places snowslides have swept across it down into the creek.

Without the outlay of large sums of money and much time it would be impossible to build a good wagon road between the two forks. At the lower fork there were several log cabins, an eating and bunk house, and a small store. While eating supper we were joined by Mr. Mendenhall and Mr. McCrea, who had made the trip from Lake Kenai in two days. McCrea, after eating supper, proceeded to Sunrise that night.

The following morning we continued to Sunrise, arriving there about 2 o'clock in the afternoon. The trail was much better than that of the day before, only two or three bad places being found, and these could be fixed without much trouble. The grade was not steep, especially for a mountainous country, and if it were not for the mud and water along the trail an animal could carry a good load without difficulty.

During the latter part of October, while I was at Sunrise, in a conversation with parties who had recently been in the Lake Kenai country, I learned that the wagon road from Resurréction Bay had been extended to the head of Lake Kenai, following the trail already described, except that it kept to the west of Snow River. The same parties informed me that the trail from Mills Creek, or the upper fork, had been extended to Lake Kenai and that pack animals with loads had made trips over it during the summer. Pack animals made the trip between the two points, but were floated down Lake Kenai on a raft.

From the lower fork a trail leads up Six-Mile to one of its tributaries, called Lynx Creek, where some claims are located.

This trail is reported to be poor. Packers charged 6 cents a pound to take freight from Sunrise to the upper fork and only about a third as much to the lower fork, although the distances are 18 and 10 miles, respectively, from Sunrise.

The lake and its tributary streams are more accessible by way of Resurrection Bay than by any other, the grades being less that way and there being a wagon road and pack-train trail.

Before the construction of the pack-train trail between the forks of Six-Mile Creek, Mills Creek was reached from Hope

by the pack train going up Resurrection Creek at Hope and then crossing from one of its tributaries to Summit Creek, the first tributary of Canyon Creek from the west, below Mills Creek.

During the winter travelers from Resurrection Bay to Sunrise or intermediate points travel on the ice over the various streams, thereby avoiding all steep grades. Mr. Mendenhall did the topographical work for the party, for which I am much indebted to him, and Mr. Bagg was of much assistance in various ways.

The trip was made in seven days, but as no steamer could be taken from Sunrise until the evening of the 8th, it was the morning of the 9th before the party arrived at the main camp at Ladds Station, on Cooks Inlet.

Pursuant to instructions, a party under my charge, consisting of Sergeant Yanert, Eighth Cavalry; Acting Hospital Steward Neville; Privates Fels, Gamble, Jones, and Matlock, Fourteenth Infantry, proceeded on board a Columbia River boat, sailed by Mr. Johnson, the Alaska Commercial Company's agent at Knik, Alaska, and started for the mouth of the Sushitna River, 25 miles north of Ladds Station, at 1 o'clock a. m. June 20, 1898. For a short distance after leaving Ladds Station it was necessary to row, but soon the tide commenced to run strong, a breeze sprang up, and in consequence we arrived at the mouth of the Sushitna River about 4 a. m., before a sufficient amount of tide had come in to make it possible to enter the river. By this time a strong wind was blowing, which, against the current of the river, kicked up a heavy sea, and for a while it was doubtful if the boat could be kept from going ashore on the bars, which Mr. Johnson said would have probably resulted in the drowning of the party. As soon as it was discovered to be impossible to enter the river, the boat was headed down the inlet, but with a strong wind and tide against it the boat could scarcely hold its own, until about half past 5, when, having drifted under the protection of a point and into calmer water, a landing was effected at the mouth of the Chuitnacocks River, about a mile below the entrance of the Sushitna River.

Breakfast having been prepared and eaten, every one slept until 5 in the evening, when, the tide being about two-thirds in, another start was made for the Sushitna River, the bars of which were crossed without difficulty. On the way

in the boat passed through a large school of Beluga whales, sometimes called the white whale, several of which were not more than 100 feet from us.

After proceeding up the river about 3 miles a landing was made on one of the flats, but, the mosquitoes being so bad, we hastily pushed out into the river and selected another camping place about half a mile farther, on an island in the middle of the river. There was very little improvement here, as the mosquitoes swarmed everywhere along the river.

The entrance to the river is very crooked, and entrance into its mouth is attended with danger at times. But there is no difficulty if the tide has come in sufficiently and the person navigating the boat understands the channel. The banks of the stream at the entrance are very low and heavily timbered, with a dense growth of cottonwood and underbrush. The river flows into the inlet through a very large delta, many miles in width, through which it discharges a large volume of water, containing a great deal of sand. Near the sea occasional patches of grass were seen which would afford fine grazing for stock.

Owing to light winds slow progress was made, only about 7 miles being traveled on June 21, the greater portion of which distance was made by the use of the oars. After traveling about 3 miles that day, we arrived at a small stream called Alexanders River, named for an old Indian chief who lived about a quarter of a mile above its mouth. This stream was the last clear-water stream seen for several days, and, as we were informed that such would be the case, all buckets were filled with clear water. During the day we sailed by Mount Sushitna, which was about 10 miles to the west. This mountain stands by itself, as if to guard the entrance of the river. Seen from near Ladds Station, one is led to believe that it stands at the mouth of the river. It, however, is some distance to the west, but in ascending the river all sides, except the extreme western one, can be seen.

On June 22 the party reached the Alaska Commercial Company's store, about 8 miles up from the camp of the day before, and about 23 miles from the mouth of the river. The store stands on an island in the middle of the river, which at this point is about three-quarters of a mile wide and 90 feet deep in places. Several Indian cabins stand near the store, with others on both sides of the stream a short distance above the

store. Near it the first rocky and bold banks of the river were seen. A stop was made here for the purpose of securing an Indian guide. Mr. Cleghorn, the agent of the company, kindly assisted me, and an Indian named Aleck promised to go, but demanded $1.50 per day. This price, I was told, was paid by the Geological Survey men, and one native having received it no other would work for a less sum, as one Indian considers himself as good as another. Some of the men having lost their head nets and mosquito bars, purchased others from the natives, and a camp was made for the night at the store.

The following morning, while waiting for a wind, Mr. Cleghorn informed me that the native hired the night before was sick, or claimed to be, but that he would secure me a better one, which he did. About 12 o'clock, however, the Indian he had secured said that he would not go unless Aleck was also taken. The cause of the trouble was the interference of other natives, who worked on the fears and prejudices of the men who had promised to go. Only one native was needed, but the situation changed so that neither would go unless both were taken. I concluded to start as soon as dinner could be cooked, and while eating it Mr. Cleghorn said that the natives had once more concluded to go, but added that when I got ready, if I would tell him five minutes before starting, the natives would go. When all was ready to start I sent word, and the natives came around and got into the boat.

Much difficulty was experienced in getting from the island on which the store stands to the first one above. From that point the boat crossed to the west side, but rocks were found at Rocky Point, so it became necessary to cross to the eastern side. After reaching the eastern bank it was necessary to tow the boat to the camping place for the night. A towline made out of a small linen rope 300 feet long was used for this work. About 3 miles was made on the 23d, but it was the hardest work any of the men had done while in Alaska. The day was hot, the current swift, and the river was full of drift-wood. In addition, the mosquitoes were so bad that it was impossible for one to protect himself from them.

Whenever possible, while ascending the river, camps were always made on sand bars in the center of the river, as it was found that there were not so many mosquitoes away from the timber, and then, too, if there was any breeze blowing, it was always in the center of the river.

The following morning a start was made, and on Monday evening about 6 o'clock the party arrived at Croto Creek, where a camp was made, a better boat for towing purposes was built, and the Columbia River sailboat abandoned. At the place where we camped June 26 we were delayed nearly thirty-six hours waiting for the wind to freshen up. The river was so swift, a 10-mile current, that it was impossible to either tow or row the boat upstream. The trouble with the sailboat was that it drew too much water, about 3 feet. This required us to keep in the main channel or swiftest current, instead of taking advantage of the sloughs, where the current was more sluggish. Frequently in towing this sailboat all hands took hold of the towline, and yet we were barely able to move it.

On June 25, while endeavoring to pass the towline around a partially submerged tree, Private Gamble fell into the river, which was very swift and deep at that point. Fortunately, when he came to the surface, he managed to grasp a limb and pull himself out in time to avoid being carried under some swift drift near by. He had a close call for his life. The same evening some Indians going down the river to the station stopped at camp. When I learned that their home was well up toward the headwaters of the Sushitna River I had them fed, so as to get some information from them. I thought that they might be of some service farther upstream, as they said they were going back to their homes in the near future.

About 3 miles above the company store a large river flows into the Sushitna, and it is called the "Yantnu" (Yedno) by the Indians, and by some white men the "Johnson," in honor of the first white man to ascend it. Mr. Johnson was with the party, and from him I obtained the following information concerning it. He said that he had ascended it about 200 miles, and that there were two passes over the mountains from the head waters to the head waters of the Kuskokwim, which were used by the Kuskokwim Indians when they came to the Sushitna store to trade. The river is full of quicksand, quite rapid, and has several tributaries.

Croto Creek is a small stream of clear water flowing from the west, and of minor importance. About 6 miles up from its mouth the Sushitna Indians have a fishing village, used in the summer time, and the vicinity of the stream is much

frequented by them in the winter as a hunting ground. A few Indian cabins were noticed near the mouth of the creek.

While busy building the boat at Croto Creek, Sergeant Yanert was sent under verbal orders to go up this creek as far as practicable, but with orders to return to camp not later than July 6, as it was thought the boat would be finished by that date. He left camp July 2 and returned on the 5th, having ascended the creek about 15 miles. The information he secured is noted on the map.

While ascending the river the men used four shelter halves, which they buttoned together to form a complete closed tent. Then by placing earth over the edges of it, mosquito netting over the top where the halves were buttoned, and driving the mosquitoes out, a fairly good night's rest could be obtained. Four men slept in each tent, but, since there was no means of ventilating it, the air became very close. If another party is ever sent into Alaska, it should be well fitted out with mosquito netting and head nets made of cheese cloth. Mr. Johnson had a small tent, the top of which was made of drilling, while the sides were made of cheese cloth, except about a foot around the bottom, where drilling was used, and on which earth was piled to keep the mosquitoes from working up underneath. While such a tent was very good for the purpose for which it was designed, it would not shed water, and should therefore be remodeled to provide against rain. Such an arrangement is almost necessary for one traveling along the Sushitna River in the summer time.

When Mr. Johnson went up the Yantnu River he and his partner built a flat-bottomed boat, very wide and long, intended to draw the least amount of water and carry the necessary stores, and as everyone familiar with towing up the rivers of Alaska recommended the same style of boat, it was decided to build a similar one for the use of my party.

Early the following morning, a suitable tree having been found which could furnish lumber sufficient to build a boat 35 feet long and 5 feet wide on the bottom, all the men were put to work getting it out, floating it to the camp, and constructing a saw pit. From that time until the afternoon of the 7th everyone, except Sergeant Yanert for a few days, was kept busy on the boat, which was finally completed, and a start was made on the afternoon of the 7th. The boat was fitted up with a mast, so that if a good breeze sprung up at any time advantage could be taken of it.

When loaded with all the stores the boat drew 7 inches of water, and when the eight men of the party were in it but 10 inches. It was found to be a great improvement over the sailboat, as it could be taken in shallow water, which was generally not as swift as the deep water, and then it towed very much easier than the sailboat. While at Croto Creek I purchased for myself a canoe, which was very useful at times for sending the Indian guide ahead to pick out a channel, and also to land at places difficult to get to with the large boat.

On June 29 one of the Indians was discharged, as he had proven himself unreliable, and it was ascertained that Stephan, the other Indian, would go with us. This Stephan proved himself a good man in many ways—thoroughly reliable when beyond the influence of other Indians, sober, and clean.

It was soon discovered that it would have been almost impossible to have made any progress with the sailboat in places, because of the swift current.

After leaving Croto Creek work was continued every day, ascending the river occasionally by rowing or sailing, but at least nine-tenths of the way it was necessary to use the towline, and usually with all the men on the line, except one to steer the boat and another to assist him in case the boat should get away from the men on the towline.

On Monday, July 11, Mr. Johnson stated to me that if I would let him take the canoe and guide for a few days he would rejoin me in four or five days and would then stay until about August 5. As none of the party could converse with the Indian, and as he stated he would not remain with me after Mr. Johnson left, I concluded to grant the request.

The journey was continued up the river until July 17, when a Midnooski or Copper River Indian was met, and by means of a little Russian and signs he told me that the Talkeetna River was a short distance ahead, and that some Americans were encamped at the mouth of it. Their camp was reached about noon, where a stop was made for dinner and to ascertain what knowledge they had of the country. They proved to be a party of miners who were going up the river on a prospecting trip and had never been in the country before. A mile beyond the miners' camp the mouth of the Talkeetna River was reached. One could see that it was not a slough of the Sushitna, because, while the water was from a glacier stream, it was not as full of sand as the water in the stream up which we had been traveling.

The forks of the Sushitna are easily recognized by the large flat, which looks as if several rivers united there, and also from the immense amount of driftwood piled up as far as the eye can see. However, before we left the miners' camp one of the men saw the signal left by Mr. Johnson, and we knew then that we were right if we ascended the supposed Talkeetna River.

Only once after the guide left us did we go wrong, which was on July 15, when we started to go up a small stream. After rowing up it for a mile it left the main river, so that it was thought best to return and follow up the main channel, as the water was apparently glacial. Later in the season it was found to be a slough of the Sushitna, but one that it took a party seven hours to go through.

On the evening of July 18 the guide and Mr. Johnson rejoined.

The Talkeetna River was found to be much swifter than the Sushitna. The current of the latter, however, was found to increase in swiftness as one approached the mountains. On the 18th not more than 2 miles was made, though harder work was done than on any other day of the trip. On the 19th the party reached the mouth of the Chinaldna, a small clear-water stream flowing into the Talkeetna, about 6 miles above the mouth of the latter. As this stream marked the beginning of the old Indian trail across the mountains to the upper waters of the Talkeetna, it was decided to make a permanent camp at this place, or until additional instructions were received from Ladds Station. The following day was utilized in making a cache for the supplies, in removing the same from the boat and drying them out, as a good portion of the same had been damaged by water.

The sugar was all more or less wet, and, although an attempt was made to dry it, a good portion dripped away in spite of all attempts to prevent it. The flour was wet for a couple of inches into the sack and had then caked, preventing the balance from spoiling. As the provisions were getting low, and it was not certain that any more would reach me, I decided to send part of the men back to Ladds Station. I selected those who had more or less experience on the water, and concluded to let them make the trip down the river on a raft. The raft was made on the 20th, out of green spruce logs tied together with inch pins, securely lashed with plenty of manila

rope, and made so strong that it was not thought possible for it to break up. At 1 o'clock p. m., July 21, Privates Bergen, Pels, and Matlock, Fourteenth Infantry, started down the river, carrying a letter to the commanding officer of the expedition, and another one to the agent of the trading company at the station, requesting him to furnish them with such provisions as they might need while at the store. They were directed to wait at Sushitna Station for a sailboat or launch, and not to try to reach Ladds Station by rafting to the mouth of the river, from which point they would have to travel down the beach.

The raft was upset or grounded three times on the way down and all of the rations, some of the bedding, and all of the tools except an auger were lost. Once it was caught on a tree 2 or 3 feet in diameter, and the only way they could get free was by boring it in two. They eventually reached the station in safety, and reported that if the raft had been constructed out of dry timber it would have drawn but very little water and would have been easily handled.

While ascending the river great difficulty was met with in trying to get around the numerous log jams found between the head of one island and the foot of the next. Generally, the water was much swifter at the head of these islands where, if a log jam existed, the water was much deeper. Frequently men would step into deep holes, and not a day passed that everyone did not get wet to the waist in the icy cold water. The hip gum boots afforded some protection, but even with them it was impossible to prevent getting wet during the day. At first the men were much afraid of the quicksand, but it was soon found that at about 12 inches below the surface of the sand a bed of hard gravel was reached. After learning this they were not cautious enough. The first thing after stopping for the night's camp two men would start a large fire, around which later all would gather and dry out the wet clothing and then prepare their beds. Many a night it would require three hours to dry out the woolen underclothing and socks. Everyone worked hard, and at times under the most trying circumstances. The mosquitoes, as stated before, were a great trial to all of us when we first entered the river, but as we went upstream more sand bars were found for camping places and they bothered us less and less until about August 15, when they

practically disappeared. A few small black flies with white legs took the place of the mosquitoes and remained until frost came. These flies did not bite often, but when they did they were savage; one of the men had his eye closed by being bitten on the lid. The fly would crawl through mosquito netting, but cheese cloth had too fine a mesh.

July 22 was used in making packs and preparing rations for a trip away from camp. Sergeant Yanert was sent up the Chinaldna with Private Gamble with orders to map that stream as far as practicable, and to try and ascertain what mineral wealth there was on it.

The following day, as rain fell all of the forenoon, a start was not made until the afternoon, when Mr. Johnson, Private Gamble, Stephan, the Indian guide, and I started over the old Indian trail to the head waters of the Talkeetna. All of us carried about 60 pounds, except the Indian, who carried about 80, and then said that his load was small. Owing to the late start, and owing to the fact that the guide lost the trail, only 5 miles were traveled that afternoon. The guide accounted for his losing the trail by saying that he had not been in the Talkeetna country for four years, and as all trace of the trail was covered up under a dense growth of vegetation the excuse was a reasonable one.

While camp was being made a heavy rain-storm set in and continued until the next morning. The guide peeled off the bark from spruce trees and placed it on the ground to give a dry place for the blankets. The trail during the day led through a heavily timbered country, covered with a dense growth of moss, and there was more or less of a swamp most of the way.

The following morning a start was not made until about 10 o'clock, in order to give the tents a chance to dry out and the bushes to shed some of the rain clinging to them until about that hour. As we had but one blanket apiece the night before, and the tent would not shed water, a very disagreeable night was spent by all. The following day a camp was made on the first mountain at timber line, which was about 2,500 feet above sea level. During the day the trail continued through timber and swampy ground. For a mile it passed through a canyon along the marshy banks of a small stream to its head, and after crossing a narrow divide descended 300 feet into the marshy valley of another small

creek. While a pack trail could be made through the country traversed thus far, a considerable amount of work would have to be done in cutting out a trail and corduroying the marshes and swampy ground.

The next morning the guide pointed out a short cut to the head waters of the Chinaldna, and stated that Sergeant Yanert might not reach it because of canyons along the river, so it was decided to send Private Jones and Mr. Johnson through that way, while the guide and myself were to go on to the head waters of the Talkeetna. The trail led up the mountain above timber line to an elevation of 3,000 feet, when it descended into a valley just at the edge of the timber. The timber line is not at the same elevation throughout, but at times varies several hundred feet within a mile, depending on the direction of the slopes of the mountain side. After traveling 3 miles the guide saw a caribou on the mountain a mile back. As we had not had any fresh meat since leaving Ladds Station, he went back and soon returned with part of a small caribou, having given a portion of it to Private Jones, who had also seen the same animal. A heavy storm came up, so camp was made for the night.

The following day the journey was resumed and the trail, like the day before, was found to keep well up on the mountains, descending at times into a valley and then running up on the mountain side again. In each valley crossed we usually found a marsh which would require work to make it passable for animals, and generally there was no timber near by for corduroying the same. Shortly before camping for the night the trail led across a canyon, the banks of which were so steep that it is doubtful if a pack animal could go across with a load. In places we were glad to pull ourselves up by grasping bushes. On one side the bank is 300 feet above the bed of the stream flowing through the canyon, while the other bank is 600 feet high and then sloped back, so that camp, which was made 1 mile from the canyon, on the divide, was 1,400 feet above the stream. Shortly after making camp the guide pointed out a smoke about a mile away, which we first thought might be from Lieutenant Castner's camp fire, but the guide fired a rifle and soon smoke signals told him that the party at the camp consisted of a Midnooski man and two children, and that they would soon call on us. When these Indians arrived they said that they were going to meet a

Midnooski Indian who had gone to the station. One of them noticed a caribou on the mountain, and, borrowing a gun, killed and sent a fine piece of it to camp. That night a heavy rain-storm set in and continued for three days. At this time the camp was at an elevation of 3,800 feet above sea level, and the clouds hung so low on the mountains the guide said that he could not travel because he could not see any landmarks. Our camp at this place was a very disagreeable one, as the tent leaked and there was no fuel to be had except a few green alder bushes.

The fourth day the trip was resumed, and a divide 4,000 feet high was crossed within a mile of camp. During the day two caribou were killed and such meat as could not be carried was cached for our use on the return trip; the guide said that the Indians living on the Talkeetna would send for it. Shortly before camping a divide 4,375 feet high was crossed, and then the trail descended for a thousand feet. Camp was made on the mountain side about 10 o'clock, when it was so dark that one could not see to travel farther.

The next morning the journey was resumed as soon as it was light enough to see. A stop was made for breakfast at the first place where there were enough bushes with which to cook that meal. The next camping place was on a small creek about 4 miles from the Midnooski village and about a mile from the Talkeetna. During the day the chord on the bottom of one of my feet was sprained, and in consequence it was necessary to make frequent stops. The descent was made into the valley of the Talkeetna from a mountain side 4,000 feet high, which was so steep that it was very difficult to descend, and which no pack animal could descend. The valley of the Talkeetna has an elevation of 2,100 feet.

Most of the views taken were ruined owing to the constant rain, which wet the camera and caused it to leak, notwithstanding every effort possible was made to keep it dry.

Owing to the injury to my foot I thought that it would be best to leave our packs at the camp and walk to the Indian village and ascertain if any of the Indians had seen or heard of Lieutenant Castner and party.

Upon arrival at the village it was found to contain three men, seven women, and about twenty children. But one man was in camp. He, however, played the part of host, offering me some tea, which the guide had brought with him.

Stephan wanted to stay for a while, and after a time he told me that the Midnooskis had not heard or seen anything of Lieutenant Castner's party. When evening arrived Stephan, the guide, would not leave, and, as I could not find my way to camp, I was compelled to stay at the village over night. The following morning we arrived at our camp about 7. As my foot was so bad in the morning, I concluded not to try to go farther, especially as one of the Midnooskis promised to pilot me to Vasili's house upon my return, which, as near as could be ascertained from them, was about 20 miles above their village, on the Talkeetna. The return journey to the camp on the Chinaldna was accomplished without incident worthy of note, except that the rations ran very low, and that a party of five white men, miners, were met about 25 miles from the camp. These men were bound for the Upper Talkeetna, and had as their guide one of the Midnooski Indians. They said that they left a white woman at their camp, which was near mine, and that because of the heavy rains they were afraid the river would rise and she might be in danger, and requested, if such was the case, that I take steps to assist her. During my absence of fourteen days from camp rain fell the greater part of every day but one. The packs, in spite of all precautions, would get wet and the rations would spoil. Most of the sugar dripped away and some of the flour was ruined by the rain. The weight of the packs was greatly increased by getting wet. Matches were kept dry in a measure by putting them in the center of the bedding and then drying them out each night at the camp fire.

When we arrived at camp the Chinaldna was flooded. Steward Neville reported that he had moved the supplies once and that it would have to be done again. Early the next morning, as the stream was still rising, everyone got into the boat and, proceeding across the stream, placed all the property belonging to the lady's party in her boat and, securing it behind a log jam, returned across the stream, bringing the lady and such articles as she needed. When the camp was reached it was necessary to move it, as the ground on which it was located was nearly flooded. The new camp was pitched on a bank which was considered safe, but the following morning it was again removed to the top of the bluff, about 60 feet above the river. Besides the government property, the stores belonging to two parties of miners were

moved. About the time the property was secured shots and calls were heard on the opposite bank of the Chinaldna, and soon two white men were seen. As soon as practicable the boat was taken across and the men brought back. They proved to be members of the party of miners seen on the trail, and came back as they were suffering with rheumatism. They were out of provisions, and, as their matches had gotten wet, were in a bad fix if they could not reach our camp. About dusk the three Indians who stopped at the camp one night on the Sushitna came up and stated that they were going to the Tanana in a few days, where they intended stopping for five days, after which they would return to the station on the Sushitna.

Upon arrival at the camp a letter was handed to me from the commanding officer of the expedition, which informed me of changes in the original plans and directed me as to future movements of the party under my charge.

Trying to act as it was thought the commanding officer would under the circumstances, I resolved to send Sergeant Yanert with Private Jones in the direction of the Tanana, employing one of the Indians to act as guide. The Indians drew several maps of the country and said that it would take fifteen days to go and about twelve to return, as on the return trip a raft could be made and used at the crossing of the Sushitna. They also stated that there were plenty of moose, caribou, bear, and ptarmigan, and some mountain sheep. They were unable to show the place on our Government maps at which the Tanana would be struck on their trail, but they described rapids on the river and drew maps of them which tended to convince us that it would be at the mouth of the Delta River.

Two of these Indians left camp on August 11, and were followed by Sergeant Yanert, Private Jones, and the remaining Indian the following day. Each member of the party carried about 70 pounds, all that was possible. Before he left, Sergeant Yanert reported that upon his first trip up the Chinaldna River he was stopped at the forks shown on the map as the place where work on that stream ceased by the high water resulting from the continual rain which compelled him to remain in one camp for three days. He was joined at that place by Mr. Johnson and Private Jones, and all thought that it was best to return to camp when the rain stopped, to

get a fresh supply of rations. Upon arrival there, Mr. Johnson returned to the station with the Indians, who brought the mail, and as soon as the weather cleared so that traveling could be resumed Sergeant Yanert and Private Gamble returned to the forks of the Chinaldna to complete some work there, and did not return to camp until August 9. After one day's rest the sergeant started for the Tanana River. More time would have been given him if it were not for the hurry of the Indians, who had stayed in camp two days beyond the time they intended. They agreed to pilot the party through and back for $20. Sergeant Yanert was furnished with $50 in cash and a private check sufficient to pay his fare from Weare to St. Michaels, providing he succeeded in getting through to the Tanana and was unable to return, in which case he was to report to the commanding officer. A letter was sent to the commanding officer with a request that he furnish the sergeant and Private Jones with transportation to Seattle. Information regarding the trip will be found in Sergeant Yanert's report, made to me upon his arrival at Cooks Inlet.

On August 13 I started with Private Gamble for the Upper Talkeetna River to meet Sergeant Mathys's party coming with the pack animals. About 60 pounds was carried in a pack on the back of each of us, and consisted of rations, except two blankets and a few necessary toilet articles. The trail followed was the same as the Indian and I had followed a few days before. Nothing of note happened on the trip until the 23d, a very stormy day, when, being desirous of making as much progress as possible, I did not stop, thinking that I could find my way, although all landmarks were shut out from view by the clouds. In a short time we were lost, but after proceeding for some time we came to a gap that was recognized, and going through it, camp was made for the night. The following day, as the fog still hung low on the mountain, no start was made, since that portion of the trail could not be traversed except on a clear day. Until after I had learned by experience I did not believe the guide was telling the truth about his inability to travel on the former trip when the fogs obscured the mountains. About evening some miners came to the camp and reported that they had lost the trail the day before because of the fogs, and strongly advised me not to travel while the clouds and fogs concealed all landmarks.

This party of miners was the one met on the return trip before, and when questioned said that they succeeded in getting to Vasili's house, and that they left a note there, as requested by me, addressed to Lieutenant Castner, telling him to come to the Midnooski village, and in case I was not there to secure a guide and come to the camp on the Chinaldna. They also stated in the note that I would again try to reach Vasili's cabin, and would meet him on the trail. They stated that Vasili's cabin was about 20 miles above the Midnooski village, on the Talkeetna River, and that the trail going there did not follow the river, but led up the mountains and through a comparatively low pass; that the principal difficulty in the way would be the crossing of two canyons; and when asked if animals could get through, said that they could if they could get by the canyons, which was considered doubtful. They described the country beyond, as far as they could see it, as an open, grassy, and somewhat marshy country, more or less intersected by canyons, which would offer the most serious obstacles to a pack-train trail that they could see. These men were nearly used up, and stated that they had had a very hard trip because of the incessant rain.

On the eighth day from camp the former Midnooski village was met, but to my surprise there were no Indians there, although the party of miners left the Indians there and reported that they agreed to take me through to Vasili's cabin. The packs were left at the fishing village, and we proceeded to follow their trail, which in about a mile from there brought us to the Indians' winter cabins. From every sign found there we thought that the Indians had left a very short time before we arrived. After searching a short time, their trail was found and followed for a mile, and, as it was very fresh and distinct, I had hoped that by climbing a high hill their camp would be seen, but once more we were disappointed, as no smoke or camp could be discovered. We returned to the fishing village and made camp for the night. The following day, Sunday, as both of us were suffering from the rheumatism, and a heavy rain fell all day, camp was not moved till Monday, when we followed the Indian trail, which led up the stream toward the middle fork of the Sushitna River. After following the trail for about 8 miles it led into a stream, and could not be found again. As soon as I was satisfied that it would be impossible to find the Indian village I struck out

for the mountains, along the Talkeetna, in the direction indicated by the miners. Camp was made for the night at the edge of timber line, and the following morning Private Gamble, who had been suffering some time with the rheumatism, was unable to go farther, so he was left at camp, and I started out to climb a high saw-tooth mountain, some 4 miles away, in the direction of Vasili's cabin, hoping thereby to see some signs of Sergeant Mathys's camp, or perhaps of the Indian village, but unfortunately the clouds hung so low on the mountains that it was impossible to see any distance and useless to climb the peak. Before turning back I came to a large gap in the mountains, which led into a valley that extended for several miles in a direction slightly south of east, and as far as I could see had a high mountain at the end of it, but it may have turned slightly to the south, and extended many more miles than seen by me. If it had been a clear day I believe that I might have seen some signs of Sergeant Mathys's party, for, after conversing with them upon my return, I am quite certain that we were not over 20 miles apart on that day. If I had known definitely that they were no farther away than that I could have reached their camp; but as our provisions were nearly exhausted and one of the party was suffering with the rheumatism, it was thought best to turn back. The return trip was commenced on Wednesday, the 24th of August, after we had eaten the last bit of provisions in our possession, but as there were some cached about 14 miles back on our trail we would have to go that far, unless we found that the Indians had returned, in which event I had some hopes of getting some provisions from them, and perhaps a guide, and then proceed to Vasili's cabin. Upon arrival at the village the Indians were not there, so, after leaving a sketch of the route to the camp and very extended directions to Sergeant Mathys as to the trail, we proceeded on to the cache.

I was much disappointed to fail the second time to get through to Vasili's cabin; but if the Indian guide who had promised to pilot me through had been at the village, as he had agreed, there would have been no trouble in getting through and several miles farther, perhaps to the head of the stream.

The time lost at the village and in hunting up the Indian camp from Saturday until late Monday afternoon was more

that would have been required to make the trip to Vasili's cabin.

After spending a night at the cache, a start was made for the camp on the Chinaldna River about half past 5 in the morning, and camp was made for the night at 8 o'clock, after traveling 35 miles. Private Gamble suffered a great deal during the day, and I was afraid at one time that he would not be able to make the camp. The last 20 miles was above timber line, and, the day being quite clear, it was necessary to make that distance before the clouds settled down and obscured the landscape and in order to get fuel for camp. We were without food for sixteen hours, and when it was cooked the bread was made out of wet, moldy flour, the lumps of which had to be mashed before making bread. During the greater portion of the trip we were on short rations, and the food eaten was such as would not have been used if good articles of ration could have been obtained.

The following morning, as it was raining hard and no one woke up until it was too late to make the main camp that day, it was thought best to remain in camp. There was no necessity for getting wet two days in succession, and then to start early the next day would enable us to reach camp before night.

The following morning the trip was resumed, and the day proved to be the second one out of fifteen days we were out that it did not rain. Camp was reached early in the afternoon of August 27, after a tramp of 20 miles. When we arrived I was informed that no news had been received from below, and that Stephan had not returned with the provisions, so that to remain here until the 15th of September, to await the return of Sergeant Yanert, would be a very difficult thing, unless we could secure provisions from the miners, or else live on flour, as all our other provisions were exhausted. Shortly after arrival at camp, in a conversation with the miners who reached Vasili's cabin, I learned that I was on the right trail, and was about halfway to the place of destination.

From the mountains along the tributary of the Talkeetna on which the Indian village was located an extended view could be obtained up the valley of the tributary. The valley varies in width from 1 to 10 miles, and was well timbered and full of small lakes. The trail followed when looking for the Indians was fairly good, well worn, and one over which pack

animals could be taken without difficulty as far as we traveled it. On the first trip to the Indian village they informed me that it was three sleeps to the middle fork of the Sushitna at the bend. The bend referred to could be seen from the mountains and was very sharp. Mountains were seen rising from the north bank of the river, while on the south side the country looked as if it was comparatively flat. As far as seen, all of the country south of the Talkeetna River was very broken, one jagged and rocky mountain peak rising after another, but none would exceed 6,000 feet in elevation, while the usual elevation was somewhere near 4,500.

The difference of elevation between the Talkeetna River at the mouth of the Chinaldna River and at the Indian village, about 50 miles away, is approximately 1,200 feet, giving a fall of over 20 feet to the mile. I could not learn if there were falls on the stream, but when questioned the Indians said that it was no good for a boat, and stated that it was full of stones and that there was a big canyon on the stream. They said that in the winter time they traveled up and down the river, so it would seem as if there were no falls, but probably rapids, and a very swift current most of the way.

From the Indian village to Vasili's cabin the Indians sometimes use canoes in going up the river, but generally they make a portage because of the swift current.

From the time of our return to camp until Sergeant Yanert's arrival nothing of importance was done, as it rained nearly every day, and I did not feel like taking the men out, as their foot-wear was worn out and none could be secured for them.

A trip was made to the coal vein, and the information secured will be noted under "Mineral resources." We were informed that from the coal vein up for 2 miles both sides of the Chinaldna River is staked out; and nearly everyone had faith in the creek, although no one had succeeded in getting to bed rock.

A fairly good trail has been made from the mouth of the creek to the claims. As far as we traveled the banks are heavily timbered with a fair growth of spruce and some cottonwood and birch.

During the fore part of the month Private Gamble was laid up with a severe attack of rheumatism, and I am afraid he will be more or less subject to it after the summer's work. For some unaccountable reason, I have been informed that all the medicine for that disease was taken out of the medicine chest before it was taken up to Alaska. More people

were bothered by the rheumatism during the summer than by all other ailments combined, and if any more work is done in Alaska plenty of medicine for that disease should be provided by the medical department.

Owing to heavy rains on the Upper Talkeetna River, it overflowed its banks on September 4, causing the water to back up in the Chinaldna until at its mouth it was higher than we had previously seen it. During the month of September the weather became colder until, on the 9th, ice half an inch thick formed during the night. While the river was flooded every now and then, trees would be undermined and fall into the river with a report sounding like the firing of a cannon.

On the morning of September 14 Sergeant Yanert and Private Jones arrived at camp, after a very hard trip. They stated that they did not succeed in getting to the Tanana River, but as near as they could judge from what the Indians said they were about 35 miles from it. The Sergeant reported to me that once while fording a stream he was washed down it and came near being washed into a canyon. This was confirmed by Private Jones. At another time the Sergeant had one of his shoes washed away, after which he resorted first to moccasins, being finally compelled to cut up his shelter half for foot-wear. With no other protection he had traveled a great many miles, and when he arrived at camp had used up all his canvas, and had nothing to lie on or put over himself while sleeping. Both he and Private Jones had a very hard trip. Both are very deserving men, meriting reward for their hard and faithful work. They ran out of provisions, and took about 30 pounds of flour from a cache made by the geological party under charge of Mr. Eldridge, who, when seen later, said he was glad the flour was used, as his party did not need it.

During the time we were encamped on the Chinaldna River, from July 19 until September 15, there were but six days during which rain did not fall, and most of the time it rained the greater portion of the twenty-four hours.

On the morning of the 15th of September camp was struck, and the party, with four miners and the lady we met on the Chinaldna, started down the river for Tyoonok. The mouth of the Talkeetna River, 6 miles below camp, was reached in an hour without any rowing except enough to give steerageway. At the mouth of this river, owing to misunderstanding

between the men handling the oars, the boat came near being swamped on a log jam. As it could not be avoided, the boat was steered straight for the jam. When it struck it slid up about 3 feet on the first log and was promptly pushed off by the man in the bow, so that no damage resulted to it.

At the mouth of the river some provisions were secured from the mining party, some of whose members were going down the river in the boat. The provisions were to be replaced by feeding those with us until a steamer for the States should call at Tyoonok, an agreement that was advantageous to all. The same party had furnished us with provisions before under the same agreement.

A cooking stove was set up on the boat, and no stop was made for meals, but about 3 o'clock camp was made, because of a heavy rain-storm. At this place we met Stephan, our former guide, who was bound for the head waters of the first southern tributary of the Talkeetna River on a mining trip. He stated that he tried to get back to the camp, but was taken sick, and when he got well the river was so flooded that he could not get up. He also said that the island on which the Sushitna store stood was flooded and some of the buildings were nearly washed away. While in camp here a party of miners arrived and stated that they had been forty-five days getting this distance from the store, about 40 miles distant. They seemed satisfied with their rate of progress, stating that some days they made as much as 3 miles a day, while other days they did not do as well, making sometimes less than half a mile a day. Their boats were not suitable, as one drew 3 feet of water and the other about 14 inches. This party was bound for the Tanana River, intending to sled their goods up as soon as the river froze over.

The following day, owing to a heavy fog, which made it too dangerous to proceed, the trip was not resumed until late in the forenoon. On the way down a rain-storm set in and continued until we arrived at the station, where we made camp for the night. About 10 miles above the station, while following one of the main channels of the river, it suddenly split up into a number of streams. Choosing the swiftest and suddenly rounding a point, the man in the bow called out that there was a tree across the channel. When seen it was too late to avoid it, and, as it reached clear across, an effort was made to run the boat over that part of the tree which was

entirely submerged, but when about half over it stuck fast, as the water was only about 4 inches deep over the tree. Saws were gotten out, and when nearly sawed in two, the tree was sprung down and the boat released, but not until it had been badly "hogged."

While at the station the lady with the party had a bad attack of heart trouble, but after the steward had worked over her for two hours she was better, and declared the next morning she was able to proceed. While at the station evidences of the flood could be plainly seen all over the island. Some buildings were partly undermined and nearly ready to topple over into the river. Mr. Cleghorn, who had spent six years at the station, stated that the past season was the worst for rain that he had seen there, and that because of the flood he would be compelled to move the station to the east bank of the river, on high ground. He also verified the statements of the Indian guide, relieving him of blame for his failure to return to camp with the provisions so badly needed.

On September 17 the trip was continued on down the river, and the sea was reached before the tide had begun to ebb, so that a stop was necessary, the time being spent in hunting. On the way down some member of the party called out that he saw a canoe coming up the river, and another said that there were two Indians in it, and another replied that the canoe was coming up faster than the boat was going down. It proved to be a moose, which escaped before a shot could be had. About 4 o'clock, thinking that the tide was about to turn, a start was made for the Beluga River, but as soon as the boat was away from land it was discovered that the tide was still coming in, so resort was had to the oars, as a camping place on the Beluga must be reached before dark, since no other suitable camping place could be found.

When the tide turned a wind commenced to blow out of Turnagain Arm, so that it was all the party could do to make any headway even with the tide. Darkness coming on and the sea continuing to increase, the waves breaking at times into the boat, it was decided to run upon the mud flats and stay there until morning—not a very cheerful prospect, without a fire and with a sick woman on board. Just as the boat was nearly beached a stream was seen, and, heading into it, we were soon in quiet water, but after proceeding

up the supposed stream half a mile it was found to be a tide slough in which fuel could be obtained, so it was decidedly preferable to spending the night in the boat.

The ground everywhere was a salt marsh, making it impossible to lie down, except on the boat, where a bed was fixed for the woman, everyone else sitting up beside the fire. All night long the cry of waterfowl could be heard around the camp, and the following morning several were killed while waiting for the tide to turn.

The mud flats along the head of Cooks Inlet are much dreaded by many, but it would seem they are a blessing in disguise, for all one has to do, if caught in a storm, is to run the boat on them and wait a change in the weather. If the shore had been rocky and one on which a landing could not have been made the night we were camped in the tide slough, the lives of all the party might have been lost.

At 6 o'clock the tide commenced to ebb and a start was made, the party arriving at Ladds Station about 10 o'clock, where it was ascertained that the permanent camp had been moved to Tyoonok two hours before; so, resuming the journey, the trip was made to the new camp shortly before the tide commenced to flood.

Nothing of interest happened at Tyoonok until the arrival of the remainder of the expedition under Captain Glenn, Twenty-fifth Infantry, on the evening of September 30, 1898.

Mr. Jack, who ascended the middle fork of the Sushitna River in 1897 to its head waters, furnished me with a copy of the map his party made of that stream and a summary of his diary. The whole is submitted with the report. As far as could be learned, his party is the only one that has ever ascended that stream above the canyon.

According to the latest reports at Sunrise City, a pack-train trail has been cut from that place to the foot of Lake Kenai, and from the head of Lake Kenai a wagon road has been constructed to the head of Resurrection Bay. Lake Kenai can be navigated by good-sized boats if there is ever business enough to warrant such on the lake.

The trail, as previously stated in the report, was very bad at the time the party traversed it, and some parts of it can never be made good without the outlay of large sums of money.

From what could be learned from others and our own experience on the Sushitna River, it would seem as if a flat-bottomed steamer, of not over 2 feet draft when loaded, could be constructed to ascend the river as far as Indian Creek, noted on Sergeant Yanert's map. The steamer would require a large amount of power to make headway against the strong current, which averages about 5 miles per hour and much more when the river is flooded.

On the way down the river the steersman, a miner with the party who has navigated the Upper Ohio, stated that a steamer could be constructed so as to navigate the Sushitna; and Mr. Jack, who has been up the river twice, agrees with the statement.

Some difficulty would be met with in finding the channel, which is shifting constantly, and in locating it where the river divides into many channels.

If gold is ever found along the Sushitna River in paying quantities, I feel sure that a steamer would be put on the river to run, probably, as far as Indian Creek, about 140 miles above the mouth. The agent of the Alaska Commercial Company stated that his company would probably build a steamer to run from Tyoonok to some point on the river whenever there seemed enough business to warrant it.

Greater difficulty would be encountered in descending the river in a steamer than in ascending it, because of the swift current, which would make it very difficult to steer a boat. The turns in the river are very short at times, and there are so many channels that a quick-steering boat would be necessary to avoid running ashore and upon log jams.

During the winter the Tanana Indians travel to the Sushitna store to trade, and are said to make the trip in thirteen days, using dog teams, by which means they often travel from 35 to 40 miles a day, according to reports. The route followed by them is up the Sushitna on the ice to the forks, and then up the Chulitna across the divide to the tributary of the Tanana, which Sergeant Yanert has mapped.

This would seem to afford a very feasible route to the Tanana and Yukon in winter time, providing one is on the Sushitna River or at Tyoonok, as he can very readily reach the Sushitna from the latter place any time of the year.

The ice that is said to form in Cooks Inlet prevents steamers from going to Tyoonok a large portion of the winter, while

the reported storms of the summer seem to deter some vessels from ascending the inlet as far as Tyoonok.

The trail across the country to the upper Talkeetna River is perhaps the best that can be found, but it is a poor one for pack animals, although they could be gotten over it. From the Indian village pack animals could be taken up to the middle fork of the Sushitna River over the Indian trail there, and, as far as could be seen, without great difficulty.

To take pack animals from the Midnooski Indian village to Vasili's cabin and from there to the Chicaloon is problematical, according to the information obtainable, because of the canyons that have to be crossed.

A pack-train trail could be constructed up the Sushitna River, but, as the valley is very heavily timbered and there is so much low ground covered with thick moss, it is doubtful if it would ever pay, because for a small amount of business it would be cheaper to tow supplies up the river, as was done last season, and for a larger amount of business a steamer would be more economical.

While a railroad could be constructed from Resurrection Bay to Sunrise, it is very doubtful if there would ever be business to warrant such an enterprise, and then again the snowslides would make it a dangerous route in places during a portion of the winter season.

A railroad could be built up the valley of the Sushitna River without any great difficulty, and from there to the Tanana by way of the Chulitna or west fork of the Sushitna River. The highest point to cross would be only 2,700 feet above sea level, and that would not be reached until a distance of 200 miles from the seashore had been covered. All of the timber needed for ties, etc., could be obtained along the route, except near the summit. An abundance of gravel for grading is found along the river and plenty of coal of an inferior quality. At times bluffs from 30 to 200 feet high rise straight up from the edge of the water, but they would present no serious obstacle if quartz in paying quantities sufficient to warrant the construction of a road is ever found along the head waters of the Sushitna River or the lower part of the Tanana River.

One drawback to a railroad in the valley of the Sushitna would be the deep snows of the winter. When the Indians were questioned about the amount of snow they replied by

raising their hands as high as their shoulders, and white men said that there was generally about 5 or 6 feet of snow on the level. This is far different from the amount that falls in the Tanana, according to the Indians, who said that there was only about 18 inches on the level, and that it was very cold there.

No especially available or suitable sites were noticed for military posts, but if the country develops so that troops are needed in the Sushitna, and a trail is ever made to the Tanana by way of the Sushitna River, an available site could be found in the vicinity of the forks. That location would be a central point, and in conjunction with a post on the Tanana would command all of the surrounding country.

Many healthful sites can be found on the bluffs along the river, and when necessity for their location arises a command going into the country can readily select proper sites, having due regard to the conditions existing at the time.

THE ALASKAN INDIANS.

The coast Indians all bear a strong resemblance to the Japs and Chinese, being small of stature and having the prominent cheek bone of the Chinese. The resemblance is so strong that it is observed and commented upon by many.

Each village contains only a few, generally under 50 souls, except Tyoonok and perhaps Sushitna Station, which have more. Each village usually has a different dialect, sometimes the natives of one village being scarcely able to understand those of another. Along the coast most of the natives understand the Russian language, and that is the principal medium of communication between the different villages. The Indians of the interior do not understand the Russian language, so that it is very hard to communicate with the various tribes that one meets while traveling in Alaska. These Indians communicate by means of smoke signals with each other, even though they belong to different tribes. While they have a sign language, they do not use it as much as the Indians of the United States.

The Indians in the interior are far superior physically to those seen along the coast, resembling the best type of Indians found in the United States. Along the coast the Indians are deformed, dwarfed, and more or less diseased. They had been for years under the domination of the Russians prior

to the transfer of Alaska to the United States, and in consequence have adopted the ways of white men to a greater or less extent. In dress they wear the same style of clothing that the white men do, except for foot-wear, for which they use a tarbeso made of the hide of a moose or caribou tanned by them. The tarbeso is not waterproof, but it has the advantage of letting the water run out when once it has soaked through, which the American shoe will not do. In religion the coast Indians are followers of the Russian church. Those of the interior, where they have come in contact with the Russians, profess the same religion, or rather its forms and ceremonies, without knowing the meaning of the same.

On the coast the natives are not polygamists, but those in the interior, along the Talkeetna, called the Midnooski or Copper River Indians, have as many wives as they can get. In the summer time tents are used for protection, but nearly all have log houses to live in during the winter, though some use nothing but tents during the entire year. The houses have a large opening in the top for the escape of the smoke, and generally have but one or two rooms, which are occupied by as many as can get into them. When the salmon start to run the natives move to some good stream and put up the winter supply of dried salmon or "eukla."

All seem to have a good idea of distance, which is expressed in so many sleeps, and also a fair idea of the geography of the country as regards important features. They are the very best hunters, and can see and locate game when a white man would not think there was any in the vicinity. All of their villages are well supplied with dogs, which are used as beasts of burden in the winter, to pull sleds, and are sometimes used as pack animals in the summer. Birch bark or skin canoes are generally used on the rivers. It is stated that an Indian will not kill a dog, but when one becomes too old to pick up its living, it is taken to some place, such as an island from which it can not get away, and there left until it starves to death. While the dog is not an object of reverence, yet the Indian will not kill or eat one of them.

The natives are very strong and make fine packers, carrying at times over a hundred pounds; while a little girl about twelve years old carried 60 pounds for 16 miles one day, the greater portion of the distance over a mountain trail very

rugged and rough. The women do the larger portion of the work around camp, while the men hunt and travel up and down the rivers. When game is once killed, the hunter usually remains near it until it is all eaten, when he goes on in search of more.

The Sushitna Indians with the party were very clean, having their soap, towels, and tooth brushes, and using them frequently.

All natives are very fond of drinking tea, using only the black when it can be obtained, and to secure it they will sell or trade any of their possessions. The Indians in the Cooks Inlet district were not addicted to the use of intoxicating liquors. When questioned about its use, some said that it was "no good," and described the effects very vividly.

They are rapidly disappearing, dying generally from pulmonary troubles, while all of them are more or less troubled with rheumatism. In a few years, around Cooks Inlet at least, there will be very few left. Villages have decreased 50 per cent in five years, so we were informed. If the Indian was taught to raise vegetables and take care of himself, his lot could be greatly improved, but to do this a certain amount of power would have to be conferred upon some one to make them do as told.

They are very superstitious, and as an instance the following is quoted: Last winter an old native failing to return at the proper time, a search was made for him, and he was found nearly dead, with a great many bones broken. When asked how he came to be injured, he said that he had met the "big man," who proceeded to kill him, and left him for dead. The Indians describe the "big man" by saying that the distance between the big man's thumb and finger was greater than the height of the tallest tree. The old Indian lived about two weeks and then died, but he did more to fasten the belief of the "big man" upon the Indians than the white men can do in years to come to raise them above such a superstition. It seems that the Indians believe that the so-called "big man" lives in the woods and roams the same, hunting for Indians, and will kill every one that is found alone; so in consequence of this belief no native will travel alone when he can avoid it. The native guide with the party would not go into the woods alone, and was afraid to have his tent pitched away from the tents of the other members of the

party. When a native is questioned about the "big man," he endeavors to avoid the subject, but if he can not do so he will not talk about him more than is necessary.

According to the custom of the natives, a son inherits from his father, receiving a certain portion of his father's hunting ground, generally the territory drained by some stream. If any other native kills game on this ground he pays the owner a certain amount, usually a quarter of the game. This manner of transferring hunting ground is said to account for different portions of the same river having different names, such, for instance, as the Talkeetna, which, according to the natives, has three different names, limited by the junction of tributaries.

The Indian depends for food upon salmon, a large number of which are caught and dried; upon hunting, picking berries, curing and selling furs and skins, taking provisions in trade, while some of the coast Indians raise a few potatoes and other vegetables.

According to my experience, the native is unreliable, shiftless, lazy, and generally worthless; more like a child than a man; promising to-day to do a thing to-morrow and then doing the opposite when to-morrow comes. As the white man encroaches on his game preserves, which is now certain because of the gold excitement, the Indian's principal means of support will decrease, and his condition, because of his shiftless and lazy habits, will become more and more deplorable, so that either the United States Government will have to take care of him or he will die from starvation. If an agent was put in charge of the Indians, and they were compelled to raise such agricultural product as are suitable to the country, and also to catch and cure an abundance of the fish, and to work whenever possible, also to spend the money received in a proper way, their condition would be greatly improved. They are docile and comparatively easy to handle, having a wholesome fear of the white man implanted in them through the dealings of their fathers with the Russian Government and its agents.

When a native desires a wife, if he is a coast Indian, he applies to the Russian priest, who marries him to the first Indian woman seen, no matter whether or not the parties care for each other.

The Russians are responsible to a certain extent for the diseased condition of the Indian, as they introduced the Russian bath. A large room with one small opening is provided, and this is heated as hot as a naked person can stand. After remaining there some time in this overheated condition the naked native rushes out into a snow bath, after which he is on the high road to consumption or some other pulmonary disease, of which all natives show symptoms. The other causes of disease among them are the constant exposure to wet and cold, insufficient clothing and food, and their dirty and unsanitary habits.

A few years ago the agent of the Alaska Trading Company wished to spend the winter in California, and having no one to leave in charge of the store he decided to leave the chief of the Sushitna Indians. Upon his return the following summer he found everything in proper shape and a fine lot of furs that the chief had secured in trade from other natives. When the company, a few years ago, stopped all credit for the natives and they were nearly in a starving condition, the same chief referred to bought a sufficient amount of provisions to carry the entire Indian village through the winter. It was reported that he had about $2,000 saved. He is very friendly with the white men, and from all accounts is an exceptional Indian.

MINERAL RESOURCES.

No signs of coal were seen in the Kenai country, but upon arriving at Ladds Station many specimens of a brown lignite coal could be picked up on the beach. It is thought that all of that coal came from veins along Cooks Inlet, in various places, and that pieces are scattered along the beach by the tide. The natives and miners pick up such coal as is needed for fuel after each tide, which always brings a new supply.

As the party under my charge proceeded up the Sushitna River specimens of coal were found on the sand bars from time to time, but more plentifully as the forks were approached. On the way down the river an outcropping of coal was seen on the east bank of the Sushitna River, about 2 miles south of the fork. The vein could not be measured, but as near as could be determined it was about 6 feet thick and of a poor quality.

Upon entering the Talkeetna River coal was seen on the bars and banks, and the same coal was found in the Chinaldna

River. It was the main fuel used at the camp on the Chinaldna River for about two months. The coal found there was a brown lignite of about the same grade as the best found in the vicinity of Tyoonok. The vein was located first by Sergeant Yanert, and is noted on his map. It is about 6 miles above the mouth of the Chinaldna, at the base of a cut gravel bank about 100 feet high. When seen by Sergeant Yanert the water was clear, and the vein could be traced across the river to the east bank. When I visited the vein the river was flooded and therefore very muddy. As near as could be determined by me, the vein was 6 feet out of and fully as much more under the water, making it 12 feet thick; but Private Gamble, who had seen it in clear water, said it was at least 15 feet thick and perhaps much more, as it extended across the river, forming its bed, and there was no way of determining the thickness of that part forming the bed of the river. The vein is only slightly tilted, and comparatively easy to work if occasion should ever render it valuable. Questions were asked the Indians as to the location of coal veins on the Talkeetna River, but they all said they did not know of any, but knew of the location of the vein on the Chinaldna River. Mr. Johnson said that he did not see any sign of coal on the Talkeetna or its tributary which he descended, and it is probable that all the float coal on the Talkeetna comes from the veins on the Chinaldna River. All of the coal found, when consumed, gave a fair amount of heat, but left a large amount of ashes. It might be that if quartz rock in paying quantities and grade was found in the country that the coal veins would become very important.

Sergeant Yanert reported that he found another large coal vein on the Chulitna River, of about the same grade as the Tyoonok coal. It is doubtful if the coal found will ever have any commercial value, except such value as it possesses for fuel in the vicinity, and even that will be small, because of the timber found in the same localities. Enough was ascertained to show that there is plenty of coal of an inferior grade along the Sushitna River.

The first traces of gold found on the trip were near the foot of Lake Kenai, where fine colors could be obtained by washing out the dirt in a gold pan. At the foot of the lake, on Juno Creek, a large hydraulic plant was being erected to wash out the gold from large gravel bluffs near the mouth of the

stream. Mining was also carried on along Copper Creek, but as this district was new and was just being developed nothing definite could be learned as to its richness.

At the junction of Mills and Canyon creeks mining was being extensively carried on, and had been for some time. All of Canyon and Six-Mile creeks and most of their tributaries are staked out and worked. Ten miles south of Sunrise City, at Hope, mining is in operation on Bear and Resurrection creeks, while across Turnagain Arm several creeks were being worked and others were being prospected. No definite information could be obtained about the amount of gold that was taken out of the Turnagain Arm district in 1897, but all stated that the amount secured the past season was less than the year before. More miners were in the district in 1898 than in 1897. Some new creeks were discovered, and more gold should have been mined, and probably would have been had it not been for the high water, which washed out the dams and sluice boxes. Gold has been taken out of the Sunrise mining district for several years, but I was unable to ascertain the amount. Along the Sushitna River fine colors could be obtained from many of the bars, but while I was on the river I did not hear of a single discovery that was certain to prove rich enough to work, although good prospects were found on the Chinaldna. Miners claimed to get from 6 to 9 cents to the pan on rim rock on the Chinaldna River 6 miles above its mouth, but no one succeeded in getting to bed rock the past season. Good prospects were obtained on the stream farther up, but nothing definite could be learned as to the richness of the Chinaldna. An old miner told me that it was the most promising stream, judging from surface indications and from the few pans of dirt he had washed out near its mouth, that he had seen in Alaska.

Late in October, before returning to the States, wonderful stories were told about the wealth of this river, but it is very doubtful if any accurate information could be obtained from the amount of work done on the stream the past season. No white man, except perhaps Russians, had ever visited the stream until the miners arrived there early in July; so all information about its wealth is derived from the past season's work. Stories were told by one man that he obtained 50 cents to the pan, and in another place that from dirt secured under a bowlder on rim rock he obtained a dollar to the pan.

While such stories may be true, yet with the small amount of work done no one can tell anything about the wealth of the stream. One small nugget, worth 56 cents, was found half a mile above the coal vein on the creek, and the people who have the claim from which it was taken are so well satisfied that they stated they were going to put in another season's work on the Chinaldna.

The Chinaldna River is a clear-water stream, very rapid, about 30 yards wide and 45 miles long, with several tributaries, and would be very difficult to work, because it is subject to floods. The stream rises in the mountains, and in a few hours after each heavy rain it is a raging torrent. The rock formation along its banks is principally slate, with thin seams of granite, while near the head waters a whitish rock, resembling gypsum in its appearance, was very common; the name of this rock, however, was unknown to everyone who saw it.

About 20 miles above Sushitna Station the Sushitna River receives from the west the waters of a small clear stream called Croto Creek, the gravel from the banks of which, when panned out, gave many fine colors. Sergeant Yanert reported that he could obtain no colors a few miles above its mouth, and probably all the colors came from the banks near its mouth. It is not thought that gold will ever be found along Croto Creek in paying quantities.

Andrews, or Hanmore, River flows into the Sushitna River from the east, about 30 miles above the station, and is said to have paying claims along it and its tributaries, one of which, Willow Creek, was very highly spoken of by some miners in the fall. Gold that was reported to have come from Willow Creek is broken and jagged, with sharp edges, and shows no sign of having been transported any distance. This is different from all the gold seen in Alaska before, which is more or less flattened and worn. Andrews River and others flowing into the Sushitna from the east rise in the mountains and flow through canyons, which make them very difficult to ascend when the canyons are reached. The head waters of Andrews River are reached easier during the summer by going in by way of Knik and then striking it near its head waters. During the winter it is more accessible by way of Sushitna River.

All of the streams from the east were more or less prospected the past season, and, from what I could learn, with

very poor success; but it is true that not many of the prospectors succeeded in getting to the head waters of the different streams because of the canyons, and it may be that when more thoroughly prospected they will show up better than they did the past season.

Mr. Johnson stated that he was unable to get any colors from the Talkeetna or its tributaries above the mouth of the Chinaldna River, and the same story was told me by the miners who went up the Talkeetna as far as Vasili's cabin. These men stated that they panned in all of the streams crossed and did not find anything that gave any promise of being valuable.

Mr. Johnson, who went up the Yantnu, or Yedna, River (Johnson River), stated that colors could be found along that stream, but that nothing has so far been found in paying quantities.

In 1897 a party of miners went to the head waters of the middle fork of the Sushitna River, but were unable to find gold in paying quantities. Their trip was the first one up the river and was hastily made, so that gold in paying quantities may yet be found when the country is more thoroughly prospected, as it will be the coming season. Sergeant Yanert reported upon his return from the tributaries of the Tanana that the rock formation of the country he traveled was principally slate and granite. He was unable to carry a gold pan with him and did no panning.

Very little quartz has been found in the Sushitna district, and none that is sure to pay to mine. Mr. Johnson brought back with him from his trip to the Talkeetna some rock that some thought would pay to work, while others were sure that it was valueless. As that rock had not been assayed when I left Cooks Inlet, it is not possible to state whether or not it is valuable. The rock is very heavily mineralized, principally with sulphides, and there is said to be a mountain of it.

The Indians reported a mountain of gold which was said to be located on the Talkeetna near Vasili's cabin, and the miners who went there went for the purpose of testing the story of the Indians. It proved, as everyone thought, a mountain of sulphides which had deceived the Indians. Several specimens were brought back by the miners and were sent below to be assayed, but the rock was not thought to possess any value. An old quartz miner who saw it,

however, thought that it should be assayed, as it might be very valuable.

While at Sunrise City, late in October, I was shown some rock which came from the mountains between Turnagain Arm and Knik Arm and the assayer's report on same, which showed it contained about $4 of gold to the ton and $1.50 of silver. It was reported to be free-milling, easy to get at, and in a very large quantity.

Reports were also in circulation in regard to a rich quartz strike near the head of Turnagain Arm which assayed several hundred dollars to the ton, but I was unable to ascertain the truth or falsity of the reports.

A few small specimens of bornite which came from the mountains east of the Sushitna River were on exhibition at the station in September. The claim has been located very recently and no work has yet been done, so that the owners were unable to judge of the value of their claims. The specimens seen were very rich, and if the vein has any size the claims will be very valuable. No other copper ores were seen and none were reported by the miners met during the trip.

Rock that came from the mountains east of the Sushitna River contained many sulphides, but, not having the means of testing it, its value was not determined.

TIMBER.

The finest timber seen in the Cooks Inlet country was found on Salmon Creek, a short distance from the head of Resurrection Bay. The principal varieties found in this region were spruce, cottonwood, pine, yellow birch, and some cedar. Some trees of the latter were found that were 3 feet in diameter, while trees 2 feet in diameter of the other varieties were exceptional. As the timber line was approached the size of the trees diminished and more underbrush was found. On the trip from Resurrection Bay to Sunrise City the timber line was found to be at an altitude of about 1,600 feet; but this line varies, depending upon the slope and the exposure to the sun's rays.

In the valley of the Sushitna River the small islands are covered with a dense growth of cottonwood and underbrush, while on the mainland spruce trees predominate over the cottonwood.

At Croto Creek, where the boat was built, no difficulty was experienced in finding a spruce tree from which ten planks were sawed, which were 35 feet long and averaged 11 inches in width. Many other trees were seen fully as large as the one cut for the boat. The finest timber seen in the Sushitna Valley was found in the vicinity of Croto Creek.

On the Talkeetna River the timber line had an altitude of about 2,500 feet, but alder and willow were sometimes found as high as 3,500 feet above sea level.

None of the timber seen in Cooks Inlet district would have any commercial value outside of the district. It makes good lumber for sluice boxes, cabins, etc., and has some commercial value as fuel. Most of the trees have too many knots to make fine lumber. The birch seen along the Sushitna River was usually very small—trees seldom being seen that were 15 inches in diameter. The birch, outside of the use of its bark for Indian canoes, is only used for fuel. Most of the birch trees were knotty, gnarly, and stunted.

No willows worthy of the name of trees were seen on the trip, all being small and about the size of underbrush.

AGRICULTURE.

The word agriculture, when applied to Alaska, seems out of place to one who is not acquainted with the country, yet there are many of the hardier products now grown in the United States proper that can be grown there. At Resurrection Bay, May 30, some of the residents were engaged in gardening and planting potatoes, several hundred bushels of which are raised every year at Tyoonok, and many bushels of the same, I have been informed, are grown at the other settlements along Cooks Inlet. Tyoonok, as shown on the map, is about 30 miles from the head of Cooks Inlet, and while there I was invited to a dinner. Everything that came on the table was grown in Alaska except the flour and the butter. Among the articles of food on the table were the following: Bear meat, potatoes, turnips, rutabagas, currant jelly, and cranberry pie. Other vegetables that can be raised in Cooks Inlet district are peas, lettuce, onions, radishes, beets, celery, string beans, and cucumbers.

Oats that were self-sown last season matured at Hope, in Turnagain Arm, which is not as favorable as Cooks Inlet proper. Wheat was sown at Tyoonok last fall by a representative of the Agricultural Department, but when seen the

middle of October did not have much of a start, due perhaps to late sowing. It seems as if it could be grown there, and it is well worth a trial.

Very fine grass is found along the shore of Cooks Inlet and through the great valley of the Sushitna River, and it is in such abundance as to be able to support a large amount of stock. The grass often grows as high as a man's head, and is so thick in places as to be more or less of an obstacle to passage through it. During the summer a better grazing country would be hard to find, but as the winter is so long it would necessitate curing a large amount of hay to last through the winter. Along the Sushitna River the almost constant rains during August would materially interfere with the work of curing hay and putting it up. Another drawback to stock raising, it would seem, would be the countless thousands of mosquitoes which swarm everywhere during the greater part of the summer. A member of the party who had been a cowboy for several years said that the valley of the Sushitna and its tributaries, as far as he saw it, was the finest grazing country he had ever seen, both for sheep and cattle.

The valley of the Sushitna River is over 60 miles wide at its mouth and 80 miles above is at least 20 miles wide, but from that point on it narrows rapidly until all the forks of the Sushitna flow through canyons. The temperature in the valley from the time the party started to ascend the river, June 19, until our return, September 18, was about as follows: During the middle of the day, in the fore part of the summer, the heat was so great along the banks of the river that at times work was suspended for about four hours. From June 20 until August 15 one blanket was usually sufficient during the night. The first frost came about September 1. The usual temperature at an elevation of 3,500 feet about August 1 was 60° F., and during rain-storms at midnight was 48° F. By September 18 all vegetation, such as vines, small shrubs, and trees, lost their leaves. All vegetation grows rapidly during the middle of the summer; there is practically no night, the sun's rays keep everything warm, and there is always an abundance of warm rains; all of which conditions are favorable to the growth of vegetation.

Traces of farming are found along the banks of Lake Kenai, where the Russians used to put up hay, while farther down toward the mouth of Cooks Inlet there are places

where hay is put up at present. The soil of Tyoonok is a very light loam and very rich. Along the west shore of Cooks Inlet, in the vicinity of Tyoonok, a bluff rises about 150 feet, after which the country is comparatively flat back to the mountains, distant about 30 miles, a great part of which land is capable of raising a large amount of vegetables and hardy products of the farm.

The valley of the Sushitna is very flat and more or less swampy, due to a great extent to the moss, which holds water, and because it has never been cleared. At times a bluff, varying from 50 to 200 feet, forms the bank of the river. Many of these bluffs contain considerable gravel, but a large portion of the valley could be made into good farming land when once cleared. All of the valleys traversed and the larger portion of the mountains crossed would afford fine grazing, as the grass grows well up on the mountains, except on the steep northern slopes.

The principal berry found in Alaska by the party was the huckleberry, of which there are two varieties. The ordinary round berry, common in the United States, was very plentiful, generally growing on a shrub about 8 inches high. Occasionally an oblong berry, resembling the ordinary berry in color only, was found. The last-mentioned berry was sweeter than the other and grew on a plant which barely reached through the moss. Both varieties of these berries were generally above the timber line on the southern slope of the mountains.

Fine cranberries are obtained in the fall along the low ground. A few wild currants are found along the banks of the Chinaldna, while it is reported that farther down the river, in the vicinity of Cooks Inlet, they are very plentiful. No wild strawberries were seen by any member of the party during the trip, and only a few raspberries were found. A peculiar berry, called the thimble berry, growing on a small, low plant, which resembles the strawberry plant, was frequently found above the timber line. This berry is full of seeds and about the size of a thimble, from which it undoubtedly derives its name. Shortly before it ripens the berry becomes red, then turns yellow and becomes more or less tasteless. If picked when red and stewed it tastes fairly well. The berry ripened in the Talkeetna country about August 1.

A small, black berry that grew on the moss was eaten once or twice, but was found to be tasteless, and no one would eat it if any other berries could be had. The moss berry ripens about August 1 and remains on the moss until the new crop pushes it off.

GAME AND FUR-BEARING ANIMALS.

Throughout the valleys and mountains of Alaska there are many game and fur-bearing animals, among which are found the following, viz: Moose, caribou, mountain sheep, bear, wolves, lynx, wolverine, beaver, fox, marten, parkee squirrels, ducks, geese, pheasants, snipe, swan, and crane.

Moose were said to be very numerous around Cooks Inlet a few years ago, but, owing to the number killed by the Indians and miners during the past few years, the numbers in the immediate vicinity of the coast have rapidly diminished, although I have been informed by Sergeant Yanert, who went to the tributaries of the Tanana, and by men who have wintered in the Yatnu Mountains, that there are large bands still in those portions of the interior. Few signs of moose were found on the Talkeetna and its tributaries. Moose are also very numerous in the interior of the Kenai Peninsula. As an instance of the way in which this noble game is slaughtered, I was informed that last winter a trader in the Cooks Inlet country paid the Indians $1.50 for the head and scalp of the moose and that in a very short time the natives near this trading station had killed over 50 moose, taking generally nothing more than the scalp and head, leaving the rest of the moose for the wolves or to rot on the ground. The moose is very shy and hard to kill, except in the rutting season, when the bull will at times charge at the slightest sound and becomes a very dangerous animal to meet. When a crust is formed on the snow sufficient to bear the weight of a man on snowshoes, the moose is readily killed in large numbers near the so-called yards.

Caribou are quite plentiful in the interior, along the mountains, where there is an abundance of the caribou or reindeer moss. The Indians say that they are very difficult to kill, but the experience of the members of the party is that the caribou is far easier to kill than the moose. When first fired upon the caribou jump around and run together, as if for protection, and if they can not see the hunter, or can not wind him,

he can fire away all his ammunition until several of the band have been killed. While making the trip with an Indian we killed four caribou in six days, and the Indian wounded three more; the meat not needed was given to Indians, or was cached for later use. One day the Indian saw five caribou and requested permission to try and kill one, and as the meat was nearly used up, permission was given; soon several shots were heard, and going up to the Indian I saw a fine caribou on the ground and he pointed out three others limping away, saying they were sick. When I asked him why he had shot so many, he replied that he wanted to see how many he could kill. I tried to explain to him that it was bad to kill game unnecessarily, but he will do the same thing over again as soon as opportunity presents itself. If the Indians were not so wasteful of the game it would last them a long time, and would, with judicious protection, increase instead of decrease, but at the rate it is now being slaughtered it is rapidly decreasing.

Mountain sheep (big horn) are reported to be very plentiful in the mountains and to afford the finest meat that can be secured in all Alaska. The sheep are always found above the timber line during the summer, on the most ragged and jagged peaks, but when snow commences to fall they are driven down until, in the middle of the winter, they are found in the valleys. While some claim that the sheep are very hard to kill, others found them quite easy. A few mountain goats are found in the Cooks Inlet country, but they are reported to be very plentiful in other parts of Alaska.

While in Alaska I saw three varieties of bear, viz, the brown, or cinnamon, the black, and the gray, or so-called "glacier" bear. Some old residents also say that there is a grizzly bear in the Cooks Inlet country, but none were seen by any member of the party. The brown bear attains an immense weight and size. Generally he will not molest a man unless first attacked, when he will fight, although the Indians around Sushitna Station are very much afraid of them, and I was cautioned by old residents to not molest a brown or cinnamon unless well prepared for him. While descending Lake Kenai one of the party saw a cinnamon bear about a thousand feet above the level of the lake. About the time the bear was discovered he noticed the party in the boat and started down the mountain side, when the boat was

promptly beached and preparations were made to receive him. When shot the bear was only about 200 feet above the level of the lake and still coming down. At another time four brown bear were found eating meat we had cached, and although we approached within 200 yards of them no notice was taken of us by the bears. The black bears are the most numerous and valuable on account of their fur, and the least ferocious of all the varieties of Alaskan bears. The gray or "glacier" bear is said to be the most ferocious and always ready for a fight. These bears are reported to attack men without the least provocation or warning.

The wolves are not very numerous; still several gray wolf skins, and occasionally a black one, are sold to the traders every winter. A few lynx and wolverine are also killed each season. Beaver and marten are more plentiful and valuable.

The most valuable fur-bearing animal in the Cooks Inlet country is the fox, of which there are four varieties, viz, the silver gray, the black, the blue, and the red, of which varieties the silver gray and black are the most valuable, while the blue brings a good price and a ready sale. Some of the small islands along the coast have been occupied by white men who have engaged in raising blue foxes for the market, feeding them on salmon. Whether this business will be profitable or not no one seems to know definitely.

Rabbits are said to be very numerous at times and then to practically disappear, and no one in the country is able to satisfactorily explain the reason for such periodic changes. In nine months spent in Alaska I did not see a single rabbit. The parkee squirrel is a small animal which burrows in the ground and is found above timber line on the southern slopes of the mountains. The Indians are careful to preserve the hide of all those killed, tanning them and making parkee squirrel robes. Many of these robes contain from a hundred to two hundred skins, and make one of the best blankets for use in Alaska.

Alaska is a great breeding ground for ducks, geese, and snipe, and in the spring and fall these birds can be killed by the hundreds. The ducks and snipe breed in the Cooks Inlet country, while the greater portion of the geese have their breeding ground farther north. Nearly all varieties of these fowl are found in Alaska. A few swan and crane were seen. Another food bird is the pheasant, of which there are two

varieties, viz, the ptarmigan and the gray pheasant, which resembles the native grouse of Washington, but is considerably smaller. The gray pheasant was not seen above timber line, while the ptarmigan, during the winter, is below timber line, and in the summer always above that line. In the winter both species of these birds feed off the spruce trees and during the summer feed principally on berries. The ptarmigan, unlike the gray pheasant, changes its plumage with the season, being brown and spotted during the summer, and as winter approaches changing as the verdure changes, until eventually it is snow white, rendering it almost invisible when on the snow.

Another small bird, spotted like the gray grouse of Washington and about the size of a "bobwhite" quail, which when shot at would run on the rocks and hide, was seen a few times above timber line at an elevation of about 3,500 feet. No one in Alaska could tell me the name of the bird. For some reason or other the Indian with me would not shoot them, saying that they were no good, but at another time when the same birds were seen some of them were shot, and, the meat supply being low, they were eaten and found to be as fine a table bird as any member of the party had ever eaten. This bird did not appear to be a migratory bird, but in the opinion of the party it was a species of the pheasant or grouse.

Among other birds in that portion of Alaska the following were found, viz, hawks, eagles, owls, camp or Hudson Bay bird, ravens, gulls, loons, plover, and curlew. When ascending the Sushitna River many of the large white sea gull were seen, with some of their young, but all had gone when the party came down the stream in the middle of September. One noticeable feature about the birds of Alaska was the absence of all song birds.

The agents of the trading company state that the amount of furs secured now is far less than the amount secured a few years ago, but at present it is a good paying business, as all furs are paid for in goods from their stores, on which a good profit is made as well as on the furs. It was reported that the agents of the Russian trading companies, when Alaska belonged to Russia, used to allow so many furs of each animal to be taken each year, and any Indian securing more than the number allotted to him was severely punished. By such a restrictive policy the fur-bearing animals did not decrease,

and in consequence they were very plentiful in Alaska during that time.

Along the coast in Prince William Sound, as well as in Cooks Inlet, there are plenty of fish, the principal varieties of which are cod, halibut, flounders, candle fish, and salmon, of various varieties in season. Thousands of cases of salmon are packed and shipped away from the region, while thousands of salmon are simply thrown away because they are not of the choicest varieties. By such a wasteful policy several other species are being rapidly destroyed which, in the future, might become a valuable addition to the food supply when the more valuable ones are no longer plentiful.

During the month of May and part of June candle fish run in countless thousands up all the streams flowing into Cooks Inlet. The candle fish belong to the smelt family, are from 6 to 8 inches in length, and are very oily. After each tide, when these fish are running, the Indians pick them up from the beach. These are then dried by the Indians and put away with the dried salmon as part of the winter's supply of food. Nearly every part of the fish is preserved, the bones and head ostensibly for the dogs, but are generally used by the Indians, as the supply is usually insufficient.

Every fresh-water stream contains plenty of salmon after they start to run, as the fish endeavor to get to the head of the stream before spawning. It is stated that these fish never go back to the salt water, but all, with the exception of the king salmon, eventually die in the fresh-water streams. On some of the streams there were so many dead salmon that the water was polluted, and there was a very disagreeable odor arising from the dead fish. At this time of the year the grass along the streams is trampled down by the bear which come down for the fish, catching and eating as many as they care for and caching the balance. By the time the salmon have traveled up to the heads of the fresh-water streams they become thin, and are eventually covered with white spots by the attacks they make on each other and by striking against rocks and snags in the streams. They can be eaten if there is no other food to be had. Every salmon caught in a fresh-water stream, when dressed, from the condition of its entrails, showed no signs of having had any food for some time.

The clear-water streams are well stocked with trout, among the species of which were the dolly varden, rainbow, and brook.

These trout are not as gamey as those caught in the States, but are of good size, weighing about 3 pounds on the average. One evening four members of the party caught, in fifteen minutes, sixteen trout, the smallest weighing about half a pound and the largest one more than 5 pounds, the others about 3 pounds each. No trout were seen or caught in the glacier streams, due probably to the muddy water, as this fish prefers clear water.

ANIMAL BEST FITTED FOR USE.

Residents of Alaska do not agree as to the best animal to use for transportation purposes both winter and summer, and I was in the country such a short time that no definite opinion could be formed by me.

There is an abundance of grass in the country for stock of all kinds, so the food question is not as essential if the animals are to be used near a settlement where hay has been put up as it is if the animals are to be used in a new country, where they would have to pick up their food each day or have the food transported.

Members of the party under the immediate command of Captain Glenn stated that the horse is preferable to the mule, as the latter animal is prone to give up as soon as he comes to soft ground. Then the mule is not a good swimmer, giving up as soon as water gets into his ears, and that is important, for if a person goes into the interior any distance many streams will have to be crossed, and generally by swimming the animals.

During the summer horses can be taken anywhere in the country traversed by members of my party by being careful to avoid the swamps and marshes, and by taking loads suitable to the country. The horses, if turned loose at night, can easily pick up all needed forage. Forage would have to be carried in winter, however, as all grass is buried under deep snow and it has lost all of its nutritive qualities.

Moose feed on the tender willow bushes and other shrubs, and it is stated that the horse will do the same, and if so a horse could partially pick his own living in the winter.

For transportation purposes in the summer, from what could be learned, it would seem as if the horse is the most suitable animal.

If reindeer will do all that is claimed for them, and can travel in deep snow, they might solve the winter transportation, as the caribou or reindeer moss is found nearly everywhere

above the timber line. In places it is so thick that it whitens the appearance of the mountains. The native caribou (sometimes called reindeer) feed off of it most of the year.

The Indian dog is used by the natives to pull loaded sleds, and with good results, as 40 miles are made in that manner in a day. Feed in the form of dried salmon is fed to the dogs in the winter, while in the summer they are expected to pick up their own food. They are sometimes used as pack animals in the summer, carrying packs weighing from 15 to 25 pounds.

In the past, with the small demand for transportation, the dog was the only animal tested, and he proved more or less satisfactory, but as the need for transportation increases it is probable that the dog will not be able to fulfill the additional demands.

Horses are used in the Northern States where the snow is as deep as in the Sushitna Valley, but roads exist in the States and are kept open all winter, while in Alaska there are no roads and almost no travel. Pack animals have been kept for several winters at Sunrise, wintering in good shape on hay made from the native grasses, with very little grain.

Horses will probably come into more general use as the country is developed and will prove as satisfactory as they do in the Northern States, but it is scarcely likely that in the unsettled portions the dog will be replaced by the horse or any other animal for transportation purposes.

RECOMMENDATIONS.

The best of food should be provided for a party going into the interior another year on similar work, and the ration should be increased in some things and have some additions made to it. It should be put up in convenient packages for transportation, and the perishable articles in waterproof sacking.

Plenty of dried fruit of assorted varieties should be provided as part of the ration, as fruit is a good preventive of scurvy and it is an article much craved by all. While berries can be picked in season, few can be found until about August 1.

The allowance of sugar is insufficient and should be increased about 50 per cent. The sugar furnished for the use of the party became wet from the constant rain and from

men jumping into the boat when it had been towed into the water too swift or deep for them to wade. After the sugar became wet it was impossible to dry it out, but instead it dripped away, and about 25 per cent was lost, the remainder becoming so saturated with dirt that if any other sugar could have been secured that with the party would not have been used. When the party arrived at Sushitna Station and a variety of food could be secured, nearly all made the first meal out of bread and syrup, such was the craving for sweets. If none of the sugar provided for the party had been lost the allowance would still have been insufficient.

Sugar should be put up in waterproof packages.

The vegetable portion of the ration should be furnished in a desiccated state, and as it is easily ruined by water it should be put up in waterproof packages. Bacon spoils quickly in such a moist climate, unless it is thoroughly smoked. Of the bacon provided for the use of the party that portion intended for issue was in very poor condition in October, having been put up slightly smoked, while the breakfast bacon had been thoroughly smoked and was in a far better state of preservation than the issue bacon.

Flour after getting wet usually dries and forms a cake inside the sack, but where it is handled as much as the flour for the use of the expedition, the cake is constantly breaking and each time it is wet the water works in farther, until all the flour in the sack is spoiled. After provisions are transported into the interior many miles from a place where a new supply can be obtained the loss of a portion becomes a serious matter.

More black tea should be taken than is needed for the use of the party, as there is no food so highly prized by an Indian as black tea, and to secure it he is willing to do any service desired. Before Indian guides could be obtained at Sushitna Station it was necessary to buy plenty of tea.

An Indian, when he first comes to camp, expects to have a cup of tea and some crackers, at least; and if these articles are not given he will not talk, but if they are he will furnish all the information he possesses.

Some chocolate should be provided, as it is very nourishing. Soldiers who are required to wade in the water and be wet every day, as members of the party were while ascending the streams, need the best of food and more variety than there is to the ration.

The whipsaw furnished from the tools of the relief expedition was worthless and nothing could be done with it. A good whipsaw was borrowed from the Indians and used until timber for the boat was sawed. The best of tools should be provided and all required furnished. In the outfitting of an expedition the opinion of an officer who has been in Alaska should be given great weight. I was informed that the chief men of the Geological Survey parties were given a certain sum of money for the use of their respective parties, and were allowed to secure such food and supplies as they deemed necessary, and were not hampered by regulations which interfered constantly with the successful completion of the task assigned to them. The Army expeditions should be treated in the same way, the commanding officer being given discretionary powers as to the manner in which his task should be solved. He should be provided with the necessary funds and be able to pay every employee in cash. When checks are given they are heavily discounted, and the native or other employee suffers in consequence, while if, as was usually done because of lack of funds, service vouchers are given, the employee is kept out of his pay for months, or if he sells it the rate of discount is higher than on the check. Such methods of doing business are prejudicial to the interests of the Government, and it is not surprising that a higher rate of pay is demanded for services performed for the Government than is required for the same service performed for private parties.

To keep faith with those employed by me, especially the Indians, resort was had to private funds, and later arrangements were made with the Alaska Commercial Company to take the service vouchers. By this means the Indians were protected somewhat, but it is quite a commentary on the Government's methods of doing business to state that such an arrangement was necessary.

Arrangements should be made by the proper officer of the War Department to do away with the majority of the vouchers and papers required for the settlement of accounts upon the completion of the season's work.

If vouchers are required from a mistaken notion that the interests of the Government are protected by their use, I might state that men can be found anywhere to sign any voucher desired. If it is done because an officer can not be trusted, then such an officer should be discovered and put

out of the service. The present arrangement of doing business tends to bring the Government into disrepute and should be modified in a country like Alaska.

Before submitting this report I desire to state that it was impossible to take copies of some of the field reports sent to you, and as they are now in your possession at Washington, while, owing to military necessity, I am compelled to prepare my report at Vancouver Barracks, Wash., the difficulty attending its preparation can readily be seen.

The majority of the maps of the trips made by me and the report of Sergeant Yanert on his trip to the tributary of the Tanana are also in your possession and could not be read by me while preparing this report. Many things concerning the trip have been too much condensed in this hurried report, and there has not been enough time given to correct that which is submitted.

During the summer a few men were bothered once or twice with bowel trouble, and nearly every member of the party was troubled to a greater or less extent with the rheumatism. There was no other sickness among the members of the party.

Each and every member of the party under my charge afforded me all possible assistance and performed every duty, no matter how disagreeable or hard it might be, as cheerfully and perfectly as possible under the conditions. It seems very hard that by reason of being in Alaska some of them suffered in promotion while performing as hard and faithful service as if they were at the front on the field of battle.

Sergeant Yanert, Troop K, Eighth Cavalry, has proven himself a worthy man and thorough soldier, well meriting promotion to the grade of second lieutenant, and he is recommended to the authorities for favorable consideration whenever promotions to that grade are made from men serving in the ranks. Attention is respectfully invited to his map and report and to the manner in which he performed all the duty intrusted to him. If work in Alaska is to be continued, no better commissioned officer for such work could be secured, if he is promoted to that grade, than he would prove to be.

In conclusion, I desire to express to you my appreciation of the assistance and support rendered to me by you on all occasions.

Very respectfully, your obedient servant,

H. G. LEARNARD,

First Lieutenant, Fourteenth Infantry.

[EXHIBIT A.]

CAMP AT PORTAGE BAY,
April 28, 1898.

LIEUT. H. G. LEARNARD,
Fourteenth Infantry.

SIR: I desire herein to outline to you a certain line of exploring work in a northerly direction from Turnagain Arm in Cooks Inlet. With my limited knowledge of the country, I can only do so in the most general terms, leaving the details to yourself. In fact, it may be and undoubtedly will be necessary for you to vary your instructions to conform to the conditions that confront you. I desire to find an overland trail from Turnagain Arm to a point on the Knik River known as Howes Station. Captain Howe informs me that there is a trail known to the Indians and which he thinks goes up Bird Creek. If you can find this trail, I desire you to follow it until he (Captain Howe) recognizes the country up to his station. You will then return to the present camp of the command.

I have given orders that Corporal Young, with seven enlisted men, also Captain Howe, his son, and Mr. Mendenhall, provided with ten days' rations, one Sibley and one wall tent, report to you for this duty. Your command will be provided with four sleds and five pairs of snowshoes. The remainder of the snowshoes will be required by the other party. Should you require more snowshoes you are authorized to purchase them in open market. You are authorized to enlist one or two Indians as scouts; failing in this, you can employ them temporarily as guides for your command.

If the conditions warrant, I suggest that you move as far forward with your entire command as practicable, at least three or four days' march. You can then establish a semipermanent camp. From this camp you can take one or more sleds with supplies for two or more days until the desired point is reached.

I desire to caution you against permitting your advanced party going too far from their base of supplies. I also desire to caution you against snowslides, which are very frequent and dangerous in this section and at this season of the year. Be watchful also of the bore tides in Cooks Inlet.

Should you be cut off from crossing the glacier on your return, you will take no unnecessary chances, but take your command to Sunrise City or Hope City. Quarter them as comfortably as practicable and send to me at our present camp, by some Indians or other experienced person, as full a report as practicable.

Very respectfully,

EDWIN F. GLENN,
Captain, Twenty-fifth Infantry, Commanding.

P. S.—In your investigation be careful to ascertain if it is or will be practicable to carry the pack mules over your trail as far as Howes Station, and, if so, with how many days' forage.

E. F. G.

A true copy.

H. G. LEARNARD,
First Lieutenant, Fourteenth Infantry.

[EXHIBIT B.]

CAMP AT PORTAGE,
May 5, 1898.

LIEUT. H. G. LEARNARD,
Fourteenth Infantry, Spruce Camp, Alaska.

DEAR SIR: I beg to acknowledge receipt of yours of the 29th ultimo and the 2d instant upon my arrival in camp on yesterday at noon.

This will be handed to you by Mr. Mendenhall, who will be accompanied to your camp by the hospital steward, as requested. The latter is supplied with an emergency case of medicines, as requested by you. As these two men increase the number of men that are strictly necessary for your needs, I suggest that you send four men back to my camp to report to me at the earliest moment when it is safe for you to do so. In doing this you will take the precaution to send an experienced man with them. If you have no other available, you will have Captain Howe escort them to such point as will be safe for them to proceed alone.

I am unable to advise you as to what steps you will take in the work laid out for you in orders previously sent you, as I am not familiar with the conditions that confront you, but I am satisfied that it would be somewhat too risky to undertake to go up Twenty-Mile or any other creek unless the weather should so change as to render traveling over the snow less dangerous than at present.

In view of these conditions, should you find it advisable to undertake this work at a somewhat later period, I suggest that you bring your entire command back to this camp, caching all of your rations and bringing with you the bedding and personal effects of the members of your party only.

I shall attempt to send you a limited supply of stationery and what blanks I have, but as to the latter I have only what I send you, and suggest that should you require the services of anyone that you employ him, and if he refuse a check for his services then pay him in cash, making the check in his favor and have him indorse it back to you. I send three official checks signed in blank; but as I have only about $75 in the bank to my credit "for transportation of the Army," you must use it well within those bounds. I also send you some transportation requests signed in blank. These you can use without any question if you will explain to the owner of the vessel how he can get his money—send them to Major Jacobs or to the depot quartermaster at Portland. You can call your orders No. 1 for all transportation purposes. The reason that Dr. Kulp has not sent you any of the things called for is that he was advised by all persons coming over the trail that it was impracticable to do so.

I have $875 of incidental money to my credit. The conditions in my own camp will be explained to you by Mr. Mendenhall, who will explain to you why I suggest your sending back four men, and also what my intentions are in regard to the work I have already planned for you.

Yours,

EDWIN F. GLENN,
Captain, etc.

A true copy.

H. G. LEARNARD,
First Lieutenant, Fourteenth Infantry.

[EXHIBIT C.]

CAMP AT LADDS STATION,
June 19, 1898.

LIEUT. H. G. LEARNARD,
Fourteenth Infantry.

SIR: You will this date assume charge of the detachment already ordered to report to you, and will proceed from this point on board the sloop owned by the Alaska Commercial Company, and of which Mr. Johnson is master, up the Sushitna River to the Talkeetna River, and as far up that river as you can safely and economically proceed with this sloop. In going up the Sushitna River you will stop at the station of the Alaska Commercial Company, where, through the assistance of Mr. Cleghorn, you will endeavor to enlist two or more suitable Indians.

Should you be unable to enlist any of these Indians, then you are authorized to employ one Indian guide and one suitable person who can interpret the language of the Matanuska (Copper River) Indians, with whom your party will come in contact at the upper portion of the Sushitna River. The compensation to be paid to such Indians you will make as low as practicable—$1 per day, if suitable parties can be procured for that price—and you should not exceed $1.50 per day. Of course those employed will be entitled to rations.

After securing the necessary Indians, to secure which you will remain at the agency a reasonable length of time, you will then proceed to the point designated on the Talkeetna River, when you will at once proceed to get out and saw the necessary lumber for at least one boat. In doing this you will procure the assistance of Mr. Johnson, if necessary. As soon as his services can be spared you will notify him that the services of himself and sloop will be no longer required by your party. You are authorized to send back to this camp on board of this sloop three or four enlisted men of your detachment or such less number as your judgment indicates can be spared without detriment to the work you expect to perform.

You will, at or near the point of dismissal of the sloop, arrange to suitably protect from the elements such stores (subsistence and quartermaster) as will be sent up with you.

In chartering this sloop it was understood that the freight should be limited to 2,500 pounds and ten passengers. As large a proportion of this as can be loaded will consist of rations, of which you will keep an accurate list. You will ration Mr. Johnson for the round trip. In making this journey, and such others as you may be called upon to make during the season, you will prepare and preserve an accurate daily record of all information that may be valuable to the development of the country, regarding topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military posts, mineral resources, timber, fuel, products, capability of sustaining stock or animals of any kind, and the animals best suitable for service in the section traveled over in both winter and summer. You will also make an examination of the small streams tributary to the main streams you travel up or down, commencing with the Talkeetna River at the point of landing of your detachment. It is not intended that you

shall make an exploration of the tributaries of the Sushitna on this trip, but it is especially desirable to note all tributaries and such information in connection with them as you may be able to collect without actual exploration.

After landing your command on the Talkeetna River, as above directed, you will proceed to the cabin of Vasili and as far up beyond that point to the stream, following the Indian trail, as you can safely proceed. Lieutenant Castner will be ordered to proceed down that river until he strikes your command with his pack animals, so that it is imperative that your command be on this river with supplies from which it is expected that he will draw for the further prosecution of the work assigned him.

As you are aware, I shall communicate with you in person, or by other means, as soon as practicable after your departure, and you will be provided with further supplies. It is my present intention to make some accessible point on the Talkeetna River as a base of supplies for exploration up the different streams to the Tanana River, and to the north generally.

The principal object of your present expedition is to find and establish such base, and until receipt of further instructions you will so construe your instructions herein. It is believed and hoped that you will be delayed sufficiently long at the point selected as a base of supply to enable you to explore by means of small parties the adjacent country quite thoroughly, perhaps as far as the head of the Talkeetna and its tributaries.

I beg to impress upon you the fact that accurate knowledge of the country traversed is much more to be desired than knowledge of the fact of your ability to get through to any given point, since the object of each expedition is to obtain information of country traversed that will assist others not so well equipped as your party will be to arrive at a safe conclusion as to the accessibility and value of it.

Should conditions confront you rendering a departure from the foregoing advisable or necessary, you must use your best judgment; but in event of failure to get supplies to the point designated, you will take the necessary steps to communicate with myself, and also inform Lieutenant Castner of the situation and the nearest point at which he may expect to find supplies for his command.

Very respectfully,

EDWIN F. GLENN,
Captain, Twenty-fifth Infantry, Commanding.

A true copy.

H. G. LEARNARD,
First Lieutenant, Fourteenth Infantry.

[EXHIBIT D.]

LADDS STATION, ALASKA,
July 15, 1898.

LIEUT. H. G. LEARNARD,
Sushitna River, Alaska.

DEAR LEARNARD: I was sorry to hear a few days since that you were compelled to abandon your sloop so soon after leaving the Sushitna Station. I heard this from Mr. Ladd, who was so informed by Mr. Cleghorn. My information is, from this source, that you were building boats at a point about 20 miles above that station.

I had made all of my arrangements to come up after you with the steam launch of Colonel Maher, when I received a note from Castner informing me that it would be impossible for him to communicate with you as directed. I discharged Colonel Maher, and went as soon as I was able to communicate with Castner, but failed to see him personally, so that I can not now tell you why he can not communicate with you. I also received news from below since then and during my absence up on the Knik Arm. I received no mules, and was informed that I would be expected to get along with those already sent; but I find that Abercrombie was authorized to purchase, and did actually bring up with him, forty head of pack animals, which gives him forty-five head to our five. I will not attempt to give you the war news, but will try to induce Mr. Falcon, who takes this and your mail up to you, to take some papers up with him.

I was authorized to send back any commissioned officer that I was able to spare from my detachment, but the boat had gone and I could not get word to you in time to get you back in time to get off before the end of this month, and even then not much could be gained. Now let me tell you what my plans are, and which I desire to have carried out.

Vasili's house is on the Chaniltno. The Talkeetna is a branch of this stream and the second one on the right-hand side of the stream you are expected to go up, and is the one down which Vasili comes from his house on the Matanuska; and I desire you to go up to his house, and from there up the stream (Chaniltno) as far as you can follow Vasili's trail, if practicable to do so with your command. I suggest that you have a boat at the point you leave the river to make the portage below Vasili's house, and this boat Sergeant Mathys can make use of to come down the river to the permanent camp after he has communicated with you on the Talkeetna, or the Chaniltno, if you do not get so far as the former.

I have heard of some mules that I can purchase at Sunrise City, and I intend to go over there to-morrow night, or as soon as I can catch the *Perry*, and as soon as they can be loaded I shall have them taken to Knik Arm, where I will go with them. I will follow Castner's trail up to the point where it branches off to follow Vasili's trail to his house, to which you will go, and from which point I will detach Sergeant Mathys with as many pack animals as I can spare. In going up the Talkeetna—the branch stream—I would be pleased to have you cut a trail sufficient for pack animals to come through, as this will facilitate your operations after meeting this train. If practicable, I wish you would keep Sergeant Yanert well in advance of your party with instructions to take advantage of any points of observation that may present themselves for the purpose of looking out for Sergeant Mathys.

When Sergeant Mathys has joined you I wish you to detach him and send him back to this camp with such men as you can readily spare. He should have at least one man to accompany him. Should you not need the Indian that I send up with him as guide, you can send him back with the Sergeant with instructions to send him back to the Knik. Give him a note to Mr. Palmer, stating the number of days he has been employed, and I will arrange with Palmer to satisfy or pay him, as the case may be.

I think it is necessary for Sergeant Mathys to be here to see to things, and he is the only member of the command that knows anything about

the property. I shall instruct him to move the camp to Tyoonok during our absence.

I will send you further instructions from my position over on Matanuska, but will say here briefly that my desire is to have you push on up the Tanana, and, if it can be arranged, to have you go on through to the Yukon. I want you to come back this way, if you can arrange it, however, but will be more explicit in the note I will send you by Sergeant Mathys.

I have figured on your rations, and think that you can subsist until the middle of August, although I realize that you will be somewhat short on one or two articles. Take time to hunt and make up any such deficiency, if possible, and I think that you can do this, as my information is to the effect that the Talkeetna country is one of the best game countries in Alaska.

If it is possible for you to spare Sergeant Yanert, I would like extremely well to have him with my command to do the mapping. I say this because I am woefully weak on that kind of work and you are well up in it.

I will arrange for his meeting me, if possible, and if it is in any way possible for you to get along without him. Castner is also asking for him. Now, in case of your failure to get through (which I do not anticipate if I can send you the stock), then I can not now tell you what to do. The only chance of failure on your part that I can imagine is for you to be so unfortunate as to lose all your supplies. I will try to inclose in this an Indian sketch of the trail known as Vasili's trail, from which you can form some idea as to what I am doing and where I am. I recall now that you made a copy of Hanmore's map, so that it will not be necessary for me to do this. Now this, as I said above, is to be taken to you by Mr. Falcon, who goes up in a gasoline launch which has good power, and he will be informed by the time he reaches you as to whether he can give you a tow or not. If he can do so do not hesitate to employ him at some agreed rate of compensation. I think that he will want to go up the Chaniltno as far as the Talkeetna on a prospecting trip, and I have said to him that I would ask you to give him all the assistance in your power. I have told him also that you might wish to get his assistance, and that if he rendered it I would see that he is properly compensated for so doing.

I am glad that I did not attempt to go up with Colonel Maher after all, as he lost all of the leaves from one of his wheels and a part of those on the other on his trip up a trifle above the station with some of his own men, so that he could barely get back to Tyoonok. By the way, should you have to turn back for any reason, I hope that you will try to get word up to Sergeant Mathys, so that he will know what to do in such an emergency.

In my last instructions I was told most explicitly that although I might, if I found that it was practicable to do so, go on from the Tanana to the Yukon, that it would be regarded as satisfactory and as having accomplished all that was demanded of me to get through to the Tanana. I will try to furnish you with a copy of these instructions if it is possible to do so.

Should Mr. Falcon, for any reason, be unable to reach you personally, I have requested him to arrange for sending this to you by a messenger of some kind and in the manner best suited to getting it to you.

Mendenhall and Bagg are with me and will go with me up the Matanuska. Kelly is with Castner, and Schlauthower is in charge of the property at the main camp until the Sergeant's return.

I wish you success in your work, I assure you, and, from what I can learn of conditions in the States, your chances of securing recognition are better if we succeed up here than if you should go down now.

Very respectfully,

EDWIN F. GLENN,
Captain, Twenty-fifth Infantry,
Commanding Expedition No. 3.

A true copy.

H. G. LEARNARD,
First Lieutenant, Fourteenth Infantry

REPORT OF LIEUTENANT J. C. CASTNER,

Fourth Infantry, U. S. A.

WASHINGTON, D. C., *March 18, 1899.*

CAPT. E. F. GLENN,
Twenty-fifth United States Infantry,
Commanding Exploring Expedition No. 3.

SIR: I have the honor to submit the following reports of work done under your orders:

[From April 20 to May 27, 1898.]

LOCATED AND ESTABLISHED CAMP AT HEAD OF PORTAGE BAY, ALASKA.

On April 20, 1898, at 6 a. m., 14 members of Exploring Expedition No. 3, with rations, camp equipage, etc., left Valdez on the steamer *Salmo* with orders from you to proceed to Portage Bay, Alaska, there establish a camp and unload supplies. We steamed all day in almost perfect weather. We passed the mouths of Eaglek, Makquik, and Port Wells, arms of Prince William Sound extending to the north, which we were afterwards to explore. The waters seemed filled with porpoise; the air full of ducks, geese, and gulls, making their way to the breeding grounds in the far north. As we crossed the mouth of Port Wells we could see the immense Barry Glacier—a live one—at the head of an arm of this bay. We reached the head of Portage Bay about 5 p. m., the distance from Valdez being estimated at 100 miles. About 5 miles from the head of the bay we passed a very desirable camping ground. We could not use it, however, as it was too far from the head of the bay, and one could not walk there along the foot of the cliffs at high tide.

At the head of the bay and foot of the glacier, between it and Turnagain Arm, which is a part of Cooks Inlet, we found several of that army of gold seekers who invaded Alaska in 1898. They were engaged in hauling their provisions, camp effects, etc., over the glacier to Turnagain Arm. Wood seemed scarce here, and the place too exposed to the

winds which blew up and down this almost landlocked little harbor. About a mile from the head of the bay, in a spruce grove, we found what seemed to me the best available camping ground. We had plenty of dry wood, a stream of clear water, a good beach, and plenty of shelter. About half the party went ashore. We put up two tents in the snow, which was 5 to 10 feet deep, and slept in them on the night of the 20th.

The next morning at 4 I left the steamer and went ashore to awaken the sleepers. They all appeared to have heavy colds as a result of sleeping in the snow. We had breakfast at once, and worked hard until 2 p. m., when the impedimenta was all ashore and the tents pitched. The large wooden boxes which inclosed most of our supplies proved very burdensome to handle with the poor means at hand. The extra weight of the boxes was many times handled under trying circumstances; canvas sacks should replace them. The work done by these men on this and other similar occasions was highly praiseworthy and creditable.

The 22d and 23d of April were spent by me in exploring the upper part of Portage Bay in a small boat. Many varieties of waterfowl gathered here previous to their flight over the glacier to Cooks Inlet country. Nearly opposite our camp hundreds of sea gulls were nesting on some rocky cliffs, down the middle of which a beautiful waterfall poured into the sea. Several photographs of this were taken. On the morning of April 24 you arrived in camp with the steamer *Salmo* and the remainder of our expedition.

EXPLORATION OF PRINCE WILLIAM SOUND.

From April 24 till May 5 I was engaged in sketching Port Wells, Unaquik, Eaglek, and Sea Lion bays, arms of Prince William Sound, which we visited while exploring for a way into the interior.

On May 6, acting under your orders, I proceeded with a small party on the steamer *Pacific* to Port Wells to investigate the small stream, called by me Whale Creek, which gave promise of leading to a divide, and possibly into the interior. When last here we were unable to see far on account of the heavy fogs, but on this day the sun was shining brightly. Long before we reached the mouth of Whale Creek we saw that our mission would be fruitless. Great snow-capped

mountains, 8,000 to 10,000 feet high, inclosed the head and sides of Port Wells.

No trail could be made into or through such a region. Glaciers abounded between the lofty snow-capped peaks. Nature had placed an insurmountable barrier of snow and ice between the seacoast and unknown interior. We determined to make a rigid examination, however, so landed by small boat. While the rest of the party went hunting I walked about 5 miles across the snow-covered flats toward the lofty mountains to sketch and photograph them. Unfortunately, the photographs proved too poor to print. Here, as elsewhere on the coast of Alaska, nature more than defies the power of man to surmount the obstacles she places in his path. On our former trip I had climbed the right-hand glacier, at the head of Port Wells, and from its summit looked far into this region. It was apparently a relic of the glacial period, for, though of great extent, only a few streams flow out of it. Its ice and snow seems perpetual. The climb to the summit of this glacier permitted us a view of its interior. As we broke trail on our snowshoes up the steep incline of snow and ice between the mountain side and side of the glacier, we could see great masses of ice and rock thrown and piled together in every conceivable position. The lower masses of ice were almost as dark as the rocks about them, having been traveling neighbors for centuries, ground down and carried along by billions of tons of their younger fellows above. We narrowly escaped several snowslides while indulging our curiosity about the make-up of glaciers.

On the afternoon of May 6 we returned to the mouth of the arm of Port Wells, which the Barry Glacier heads. We went up this inlet to within half a mile of the sea end of the great glacier. Photographs were taken and the interesting manufacture of icebergs watched. The latter consisted of the breaking off and tumbling into the sea of tons of blue ice from the face of the glacier, accompanied by the roar of a Niagara, as the berg started on its ocean voyage, eventually to melt and become a part of the tides which now carried it away. We reached camp at Portage Bay in the evening.

OVER THE GLACIER FROM PORTAGE BAY TO TURNAGAIN ARM AND COOKS INLET.

On May 10 I left camp at Portage Bay, with orders from you to proceed over the glacier to Turnagain Arm and Cooks

Inlet, and to secure guides for, and information about, the country at the head of Cooks Inlet, to find a camping place on same, and sketch the country visited. I had one companion, a civilian. We had little difficulty in crossing the 5 miles of glacier which prevents the Kenai Peninsula from being an island. Snowshoes were only necessary the first 2 miles, after which the hard-frozen trail held our weight. Many glaciers entered the one we crossed; the largest extended for 20 miles to the southeast, to the head of the false arm of Portage Bay. This is known as the Blackstone Glacier, named after the man who, with two companions, perished on it during the winter of 1896–97. We reached Spruce Camp about 2 p. m.; here we found several camps of miners, and three men who had previously crossed the glacier with Lieutenant Learnard. The next day we wound down Turnagain Arm, at high tide, to Quartz Camp, 5 miles below the south side of the arm. Here we expected to meet some of the boatmen who carried passengers to and from Sunrise City, 25 miles below. It proved too stormy to attempt to navigate this dangerous body of water, so we were compelled to return with great difficulty against wind and current to Spruce Camp. Next day, the storm continuing, we did not go to Quartz Camp, believing no boat would come up from Sunrise.

On May 13 we had more luck, and I succeeded in finding a man ready to go to Sunrise. The men returned to Spruce Camp. The tide rises and falls from 30 to 40 feet in this arm. It frequently comes in as a bore—that is, a wall of water from 2 to 10 feet high, held back by the strong winds which blow down this arm. At low tide the country, which is part of the sea at high water, is uncovered for miles. A boat caught by a bore from 2 to 10 feet is almost sure to be swamped and its occupants drowned. For this reason Turnagain Arm is a very treacherous body of water, and one which few sailors care to navigate. It is inclosed between steep mountains which are wooded to their summits. The tide-covered lands contain abundance of bad mires and quicksands.

Quartz Camp consisted of about four hundred miners, living mostly in tents. At Sunrise, on Six-Mile Creek, I found many houses and stores; the population is estimated at 800. A trail goes up this creek and across the Kenai Peninsula to Resurrection Bay on the Pacific coast. Another one goes up Bird or Indian Creek, emptying into the arm almost opposite Sunrise, to Knik Arm. At Sunrise I met many pleasant people

who are interested in the mines thereabouts. Among them were Messrs. Buckley, Davis, Perry, Spillum, and Hicks. The first four were of the only party of white men who had ever been, up to that time, to the head of Sushitna River. Mr. Hicks was the only white man who had ever been to the head of the Matanuska River. They kindly furnished me with much valuable information. I engaged Mr. Buckley and Mr. Hicks as guides, subject to your approval.

My stay in Sunrise was prolonged because no vessel could come in from Tyoonok on account of the bad weather in Turnagain Arm. I walked down to Hope City, on Resurrection Creek, 12 miles from Sunrise, to see Mr. Walker, the gentleman for whom Walkers Fork of Forty-Mile River is named. He gave me some valuable information of the Tanana and tributaries. I sent a message to you by a party going over the glacier on the 19th. At last the steamer *Perry* arrived, and on May 21 we left for Tyoonok, stopping first at Knik. This was the first time a steamer had ever entered Knik Arm. We reached Tyoonok May 22. It is situated on the north side of Cooks Inlet, about 70 miles from its head. The town is on a sand spit, and has poor water and no facilities for getting wood. There were about four hundred miners here, mostly living in tents, preparatory to going into the Sushitna and Knik countries to prospect. While at Tyoonok, I was the guest of Mr. T. Hanmore, the Alaska Commercial Company's agent. On May 23 I walked up to Ladds Station, 5 miles above, at the mouth of Sushitna River. This seemed a far more desirable camping ground than Tyoonok, as we had plenty of good water and wood; also grass, if we secured stock. I returned to Tyoonok, but got very warm in walking, and, having no other foot-wear than wading boots, contracted a severe cold and sore throat. To Mrs. Hanmore I am much indebted for many acts of kindness during my sickness.

As it was now too late to go back over the glacier to Portage Bay and expect to reach you, if you left there on the 24th as you intended to do, I awaited your arrival at Tyoonok. On May 26 the steamer *Perry* came in from Sunrise with letters from you, and an individual named Howe, who was supposed to be a guide for Alaska. His knowledge of trails in Alaska I found to be about as much as mine is of trails in the Sahara Desert. Guide (?) Howe was at Sunrise and on his way to report to me with a detachment. On the morning of

the 27th a steamer was seen coming up the inlet. Believing it to be the *Valencia*, with you and party on board, I got out of bed, the first time in two days, and went out in a heavy sea to meet you. Unfortunately, there was some misunderstanding on the captain's part about stopping for you at Portage Bay. At his invitation I went back around the Kenai Peninsula and met you and Dr. Kulp on board the steamer *Wolcott*, which eventually brought all the party around into Cooks Inlet, where camp was established at Ladds Station on May 31.

[From June 8, 1898, to March 1, 1899.]

On June 8, 1898, at 2.30 p. m., Mr. Hicks, guide; Corporal Young, Privates McGregor, Ayers, Woodruff, Evans, Powers, Fourteenth Infantry; Private Von Schoonhoven, Hospital Corps; Packer Dillon, myself, four mules, one horse, rations for seven days, tents, bedding, cooking utensils, left camp at mouth of creek on Knik Arm, where we had been landed by the steamer *Perry* on June 7, 1898, 2 miles below Knik Indian village, and started to find and establish a trail to Canyon Gulch, a tributary of Matanuska River, 90 miles from Camp Knik, in obedience to your orders and instructions, dated Ladds Station, Cooks Inlet, June 6, 1898. Private Dillinger, Fourteenth Infantry, was left at camp to look after supplies. An earlier start than 2.30 p. m. was not possible on account of the tides.

The course was east of northeast, along the beach of Knik Arm, at the foot of a bluff about 100 feet high, well timbered with spruce, pine, cottonwood, and birch. At about 1,200 yards and 1,700 yards, respectively, two creeks were crossed with much difficulty, several of the animals running out of the trail into deep mud, necessitating their unloading and causing considerable delay. At the end of two hours we had reached Knik Indian village, where the bluff gave way to a gently sloping hill 2 miles from camp. From this point the trail followed the beach almost east around a bluff turning more to the north again, over meadow lands along the Knik Arm. At 1 mile from the Knik Indian village a small lake and marsh appeared about a quarter of a mile to the left of the trail. A mallard duck was killed in the marsh before it was discovered that she had a brood of young ducklings about her. In another mile a small deep creek was crossed, the

trail following a low wooded ridge, continued east of northeast, at the foot and on the sides of a steep ridge, along the Knik Arm meadow lands. Another small creek was crossed in about 2 miles. A mile farther on, following the meadow land at the foot of a low wooded ridge, we crossed a small creek and went into camp near a deserted log cabin (Melishe's) at 9.30 p. m., on the bank of a meadow stream of considerable size, which flowed to the southeast into Knik Arm. We had made 7½ miles, and the men and animals were very tired; the mosquitoes plentiful.

Most everyone overslept next morning. We got a late start—10.30 a. m. We turned up through the timber on a low ridge above the meadow land, two men assisting Mr. Hicks in cutting trail. The direction was northeast for 2½ miles, when we turned away from the meadow lands, crossed the head of a small creek, and 1 mile farther on descended from the ridge, turning to the east across Duck Creek, crossing a trail going toward the Sushitna River used by the Indians. Duck Creek flows into Knik Arm, and beyond it the country was swampy. We crossed a small creek flowing into Knik Arm half a mile beyond Duck Creek. Both streams drain a series of lakes in which the Indians fish. The trail then turned more to the north through wooded, mossy swamps, over low ridges and knolls, all well wooded. Mosquitoes proved very bothersome. The heat was intense and water scarce in these swamps. As evening approached, the question of water became an all-important one. At last some very poor, yellow swamp water was found, and we went into camp at 7 p. m. The animals showed signs of fatigue and distress and seemed a very poor lot. Distance traveled, about 7½ miles. We were camped on the edge of a swamp. No one who has not experienced it could possibly understand the annoyance mosquitoes are in this country. Our hands and faces were protected by gloves and netting, but, asleep or awake, eating or drinking, they find a way to sting and bother one. The food one has to eat gets full of them. We lived almost entirely in small tents. Getting inside, and killing all the mosquitoes, we sometimes got a little rest. Most of the men slept in a large conical wall tent, inside of which there were more mosquitoes than outside. It was very hard to lead mules or cut trail all day, fighting mosquitoes all the time, then have to eat them at meals and fight them all night. The men were very much dissatisfied and wanted to give up.

On June 10, at 8.10 a. m., we started in a northeasterly direction. Privates McGregor and Ayers were sent back to Knik for seven days' more rations, with one mule. Our course was along the edge of the swamp for three-quarters of a mile; we then turned southeast for three-quarters of a mile to get across the swamp at a suitable place. After crossing, we turned again northeast for 1 mile, when we began to ascend a ridge of considerable height on the border of a large swamp. This ridge we continued to follow for about 3 miles, going into camp on it at 6 p. m., about 800 feet above the water in the swamp at its foot. To have descended with all our impedimenta and the animals to the water would necessitate our climbing back again, with great difficulty, in the morning, as we could not travel in the swamp. During the night one of the mules became entangled in the picket line and was so lame next morning that I left him, with a portion of the provisions and bedding, in camp, intending to double-trip the distance with the other three. We continued on the ridge in a northeasterly direction for about 1 mile, when we left the ridge and swamp to descend through a swale for about 1 mile, only to strike the same swamp, which had turned from east to north. We turned to the east along a low ridge above the swamp, but could find no place to cross, so came back on our trail three-quarters of a mile and turned to the north along the swamp for half a mile. We went into camp at 3.30 p. m., to allow for the double trip, and because the horse became quite ill. The distance made was about 2½ miles. Our guide, Mr. Hicks, wanted to quit, but I assured him we were doing our best and would keep on trying till ordered to stop, or we found we could make no headway.

On June 12 I sent back the four animals and all the men except Powers, Von Schoonhoven, and Hicks. The latter looked for and found a crossing place over the swamp. The men and animals returned to Knik camp for more rations. On the 13th the trail was cut ahead to the crossing place in the swamp, and the latter brushed to make it secure for the animals. On the evening of the 13th Privates McGregor and Ayers arrived with one mule and seven days' rations from Knik. On the 14th all impedimenta was moved, by three trips, to a small lake 2½ miles in a northerly direction from camp. On the 15th a trail was cut in a northerly direction along the bank of the lake for 3 miles. Hicks killed a bald

eagle. Plenty of grass was to be found along the trail and the outlook for water was better. This lake was one of a long series which Duck Creek drained; it seemed full of fish, but none could be induced to bite. On the 16th all took a much-needed rest. In the evening the men, four animals, and one Indian returned from Knik camp with fourteen days' rations.

On June 17 we left camp at 6.50 a. m., going in a direction east of northeast, on a low ridge around the lake. Between it and another lake to the right a trail was cut through thick brush. We continued on the ridge, turning more to north between the lake on the right and the creek on the left. Two and a half miles from camp we left the lakes and turned northeast over a low ridge, through thick timber and brush, for a mile, then wound down from the ridge east and northeast for another mile, striking a small lake. We followed the lake for three-quarters of a mile east of northeast, then turned east and crossed a creek, an outlet of the lake. Two hundred yards farther on we camped on a smaller creek, a tributary, at 4 p. m. The distance made was about 6 miles—Camp No. 6 from Knik camp.

We left camp at 6 a. m. June 18, cutting trail through thick brush, over ground rising gently, in a direction east of northeast. At 2 miles from camp we descended into a swale, crossing a small creek flowing into Matanuska. A half mile farther on we passed near an open bog, the first encountered since leaving Knik Arm meadows. It was evidently a dried-up lake. We continued on rising ground east of northeast, having to cut much brush and tag alder for 2½ miles. We made camp on a high bluff above the Matanuska River, flowing to southwest and south, about 1 mile wide, full of sand bars, and a muddy, glacial stream. There were high bluffs on each side, the bluffs on the opposite side running back about 12 miles to mountains, between Matanuska and Prince William Sound. The distance traveled was about 5 miles. Our camping place we found to be the haunt of many bears. Hicks saw three on the afternoon of the 17th, but he had no gun.

On June 19 we left camp at 10.30 a. m., going northeast, through thick brush, on a bluff about 700 feet high, above the swiftly flowing Matanuska. A mile and a quarter from camp we turned to north, to avoid brush, for half a mile, then turned northeast on bluff for 2½ miles. We then began to descend

steep slopes and hillsides to Moose Creek, a tributary of the Matanuska, coming for 25 miles from the north and northwest out of the mountains, between the Sushitna and Matanuska rivers. We continued to wind down a succession of steep slopes to the creek bed, going into camp at 8.30 p. m.—Camp No. 8; distance from Camp No. 7, 5¼ miles. In Moose Creek we found very swiftly flowing clear water, with a few fine gold colors on bars. Camped about half a mile from river. The grass was plentiful across the creek, on which side a series of ridges about 1,000 feet high appeared, promising steep, hard climbing.

On the morning of June 20 I sent back to Knik camp Privates McGregor and Ayers, with two mules, for fourteen days' rations. Crossed all impedimenta over creek, one mule being severely injured in one hind leg. Owing to a misunderstanding between Hicks and Private Von Schoonhoven, no advance was made on this date beyond crossing the creek. Von Schoonhoven informed me that Hicks did not think it wise to advance up ridges, as we could not cut trail over them to water by night. This was not true, and Hicks did not say it. Trail was cut for about 3 miles by Hicks's Indian, Von Schoonhoven, and Evans. Then the latter two came back to camp, leaving Hicks and the Indian waiting and expecting me with the animals. When they had not returned by 10 p. m., I went out to look for them, but lost the trail about 2½ miles from camp and had to return, getting no answer to my shouts or shots. Hicks and the Indian reached camp after midnight. This same morning Private Von Schoonhoven, in whose care I had left the chronometer, brought it to me in a damaged condition, reporting that a mule had stepped on it. This I will never believe, as the man's manner then, before, and afterwards convinced me some other agency rendered this instrument unfit for further service. However, the instrument could not have been carried thereafter, in any way, and kept any time or rate which could be depended upon in observation. Neither it nor the sextant, with artificial horizon, are practicable instruments to carry with a pack train through a country so rugged and uneven as Alaska, where mules are constantly falling into marshes, streams, and down hillsides. On this day I went down to the river and followed it up for about 2½ miles, when it narrows to 400 yards in width, coming through a canyon.

The mountains on the opposite side were now about 6 miles from the river. Above Moose Creek on our side of the Matanuska was an old camping place of the Matanuskas, used in their journeys up and down the river.

On June 21 we left camp at 7 a. m., winding in a northeasterly direction up the steep ridges for about a mile, then turning east of northeast on the ridges for 2½ miles we came in sight of the Matanuska above the canyon, being on a ridge about 800 feet above the river. We turned almost northeast along the river, through thick timber and brush, for 2 miles. We then began to descend to the valley of the Matanuska, striking it at the mouth of a small deep creek, going into camp at 4 p. m. Considerable time was required for bridging the creek. Camp No. 9 from Knik camp. Here the Matanuska was about 1,200 yards wide, full of bars, on which a number of wild geese were breeding. Distance traveled, about 6 miles. The ascent from Moose Creek was very trying on the animals, calling for their best efforts, although good animals would have made it without any great effort. Packer Dillon informed me that these animals, with one exception, had been left behind at Dyea when the majority of the pack train at that place was ordered back to the States to engage in the war, the intention being to condemn and sell them. Although their loads were from 100 to 175 pounds, they were completely exhausted on reaching camp each evening. We were making from 5 to 7 miles a day, and not leaving camp until noon, so that they were under their packs about three to six hours a day, yet they presented a perfect picture of fatigue and exhaustion on entering camp. No doubt the heat and mosquitoes had much to do with their fatigue and loss of flesh, as they had with our own weakness and loss of flesh. On the evening of this day the animals broke away and started back over the trail. I became acquainted with this fact about 11 p. m., when I ordered Packer Dillon and Private Powers to bring them back, which they did about 1 a. m. It was the custom to picket the horse and leave the mules free. The former had not been securely tied on this occasion, so ran off, followed by the mules.

On June 22 we left camp at 8.30 a. m. We traveled in a direction east of northeast, along bank of Matanuska River, and crossed creek at the camp by bridging it. Passed a small lake and marsh to the left of trail, crossing creek from lake

to river, 1 mile from camp. We turned away from the river 500 yards beyond creek, and followed old game trail through firs to river for three-quarters of a mile. Continued toward east over bars of river, crossing small creek 2¼ miles from camp. Kept on bank of river and over bars until 6.15 p. m. Bridging one small creek, we went into camp at the junction of Granite Creek with Matanuska River. Distance made, about 5¼ miles. The trail improved, but it was a poor camp for grass. Granite Creek comes from the northeast, for about 30 miles, out of the mountains, between Sushitna and Matanuska rivers, and is clear and swiftly flowing. We found a few fine gold colors on bars at its mouth. The Matanuska is about 70 yards wide at its mouth, very deep, and swiftly flowing. On the opposite side of the river are high bluffs. Mountains are about 4 miles from the river, and 12 miles from the river on our side of it. A small creek enters Matanuska opposite the mouth of Granite Creek.

On June 23 we left camp at 6.30 a. m. We traveled northeast across Granite Creek and along the bank of Matanuska, crossing a small creek 1¾ miles from camp. We turned east along bank of river, which was now 1,500 yards wide, and passed small lake on left of trail. Crossed a creek. Here we found plenty of grass. We wound away from the river through firs, following old Indian trail toward northeast and then east to mouth of Kings Creek, 5½ miles from camp. Left Matanuska, coming from east, about 80 yards wide, out of mountainous region. Turned east of northeast up Kings Creek, passing old log cabin, for about a mile and a half, and went into camp on bank of creek at 4 p. m. Distance traveled about 7 miles. The trail was very brushy in places. Poor camp for grass. Kings Creek is clear and swiftly flowing; it comes for 25 miles southeasterly out of the mountains between Sushitna and Matanuska rivers. A few traces of gold and copper are found in the sand. A ridge about 1,500 feet high is on the opposite side of Kings Creek, between it and the Matanuska River. We sent back animals and all men, except Hicks, Woodruff, and the Indian, to Moose Creek for more rations, to which place Privates McGregor and Ayers were to bring fourteen days' rations by the 26th of June. Corporal Young and Private Von Schoonhoven were to wait for these. Packer Dillon, Evans, and Powers were to bring back two animals to us by the evening of the 25th of June,

with the rations which were cached at Moose Creek when we left there June 21. We had no tea, coffee, or sugar at Kings Creek, bacon and bread being all the food until more was advanced.

On June 24 we cut 3½ miles of trail east of northeast along Kings Creek, to a suitable place for crossing. Rested at camp on June 25, eating last of rations. Packer Dillon did not arrive till 11 a. m. June 26. He stated the animals gave out coming back on the 25th from Moose Creek, and he camped 2½ miles from Kings Creek on the bank of Matanuska River.

On June 26 we left camp at 1 p. m. We followed the bank of Kings Creek east of northeast to crossing place, 3½ miles from camp. Crossed a small creek three-quarters of a mile from camp. All carried bedding, etc., nothing but rations being on the animals, one horse and one mule. We worked till 7 p. m. to get a bridge across to where the camp was made on the south side.

On June 27 we completed the bridge by 7 a. m., and followed trail made by axmen, in an easterly direction, out of the valley of Kings Creek and up a steep hillside about 1,000 feet high; thence for 3½ miles easterly over wooded and brushy ridges. Turned to northeast to descend from ridge to a small lake, along it three-quarters of a mile northeasterly, thence easterly over a small ridge for 2 miles. Descended to a small creek flowing toward the east, and went into camp at 8 p. m.—Camp No. 13. Distance made, about 7 miles. Plenty of grass and good water.

On June 28 we left camp at 8.15 a. m. We traveled easterly down creek, and crossed it in 200 yards. Followed a bear trail and passed a small lake into which a creek flows. Ascended a small ridge and then descended to and crossed a small creek 2 miles from camp. Turned more to east from creek, up low ridge, following game trail. Descending, we passed a marsh and over burned tract across a small creek flowing into Chicaloon Creek, thence up on high ridge above Chicaloon Creek, following old Indian trail; thence south of east and northeast down steep slopes to bed of Chicaloon. Went into camp on bar of creek at 4 p. m. Distance made, 5½ miles. Grass scarce. The Chicaloon is a swiftly flowing glacial stream, the largest of Matanuska's tributaries, coming from northeast for over 50 miles, out of the mountains between Sushitna and Matanuska, now about 5 miles from us. We

found a few fine gold colors and signs of copper on bars. Rations were now getting scarce, so decided to travel slowly to allow Corporal Young and Private Von Schoonhoven, who had but one very old mule, to catch up with us.

On June 29 we left camp at 10 a. m. Traveled northeast along the bank of Chicaloon Creek and looked for suitable place to bridge it. We found a likely spot a mile and a half from camp, but several efforts to get logs across were frustrated by the current. We worked all day building abutments and cutting down tall spruce trees, only to have them washed away. Rain fell throughout the day. Went into camp on our side of the creek and decided to ford the stream, riding across on backs of the animals, about 500 yards above camp.

On June 30 we left camp at 7 a. m. and forded the creek. Followed down the opposite bank three-quarters of a mile southwesterly. We crossed Boulder Creek, entering the Chicaloon from east of northeast, and went into camp at 10 a. m. to await arrival of Corporal Young, who was now overdue. We had nothing but bacon and tea to eat. Sent Hicks, Woodruff, and the Indian up on mountains to the north of camp, between Chicaloon and Boulder Creeks, to hunt bighorn sheep, having seen plenty of them from the camp on the Chicaloon June 29.

On July 1 Corporal Young and Private Von Schoonhoven arrived, with one old mule, rations, mail, and orders from you. Hunters returned in the afternoon, but got nothing.

On July 2 sent back all animals and men except Hicks and Von Schoonhoven, Corporal Young, one man, and one mule, to go to the lakes after food and articles cached there. Packer Dillon and the rest of the party were to bring rations from Moose Creek with orders to McGregor and Ayers to bring next rations to Kings Creek cabin from Knik. Rested at Boulder Creek.

On July 3 we took three days' rations and went up on the mountains between Boulder and Chicaloon, sheep hunting. Saw sheep on July 4, but got no shots. From the mountains we had a good view of the country toward Sushitna up Chicaloon country. It seemed very rugged, glacial, and mountainous. There was no trail up the Chicaloon worthy of the name. Vasili had gone that way, but he had traveled where no pack animal could go without great labor in cutting the trail. Toward Prince William Sound across the Matanuska the

country is one mass of snow-covered mountains. A few small streams drain this region. For the most part it seems to be frozen up, and white men and Indians, according to reliable report, know little or nothing of it. On very clear days three very large snow-covered peaks are visible in the interior of this region. It is difficult to estimate their height, but I should think the largest at least 15,000 feet above sea level. The Matanuska could be seen flowing close up against this icy region, and a large glacier was visible about 25 miles up the river from the mouth of Chicaloon, extending at least 30 miles back into this region. A stream of considerable size flowed out from under the glacier.

On July 5 as on the 4th, it rained. But four sheep were killed out of a band of seven discovered close to camp.

On July 6, two were packed back to camp at Boulder Creek, where we found our Indian Billy and another Knik Indian, called Jew, with orders from you of July 4.

On the morning of July 7 we had the pleasure of greeting our chief of scouts, Mr. L. S. Kelly, who came into camp before we were up, carefully guarding a package of oatmeal. He had come along the trail from Knik camp by easy stages. He was invited to make himself at home, as, not making any report to me, and stating that you were to send him with six mules to Copper River, I concluded he was not part of the detachment under my command. On this day we brought the remaining two sheep into camp, and found our provisions were to be sheep meat and dried apples for some time to come, as they had been since the 5th. Packer Dillon did not arrive until 10 a. m. July 11. He was due the evening of July 7, but Corporal Young did not have a correct idea of his orders and sent Dillon to the lakes, remaining at Moose Creek himself. This made Dillon due on the 9th, but he claimed he could not reach us earlier than the 11th on account of the rains and because the corporal had not specified any time. As we had had nothing but sheep and dried apples since the 5th, Packer Dillon was given instructions as to future conduct.

On July 11 we left camp at 1 p. m. and wound up a steep hillside south of east and then east away from Boulder Creek. Nothing but provisions were carried on the animals. Getting on this ridge, which is about 1,200 feet high, we followed the trail cut out by the axmen, a little north of east, past a small lake 2½ miles from camp, paralleling the course

of Boulder Creek, which flowed through a deep canyon on our left. At 4 miles from camp we, having been constantly ascending, climbed out of the thick timber, up a short, steep slope, onto an elevated plateau, very scarcely timbered, and continued in an easterly direction for about 2 miles. We went into camp on the bank of a small creek, which empties into Boulder Creek about half a mile to the left of our trail, at 7 p. m. Grass and water good and plentiful. Wood rather scarce.

On July.12 everyone except Hicks and Kelly were sent back to Knik, with orders to McGregor and Ayers to leave their rations at Kings Creek, and the five animals, with Dillon, Corporal Young, Private McGregor, and Indian Billy, to leave Knik on July 20 and reach Camp No. 17 by evening of July 24, bringing the rations specified, so that in case you returned to the States and desired to let me go on, or I did not hear from you, which I interpreted meaning for me to go ahead, from your previous orders to me, I would be able to start on July 25, with rations for about four men, and reach the camp of the Matanuska Indians about August 6, and then hire a sufficient number of them to pack to the Tanana and report on the practicability of the country for a pack-animal trail, as I feared, from experience with the animals to date, that they would never be able to make the Tanana with so late a start if the trail required as much cutting as that already established. We were now between 75 and 80 miles from Camp Knik, which distance we had made between June 8 and July 11. Almost every mile of the way we had to cut trail to make these 80 miles. The animals had been constantly on the move, having traveled close to 500 miles. They were now called on to come these 80 miles with 200-pound packs in five days. The accomplishment of this task during five days of continuous rain was encouraging and showed what could be done when the trail was located, cut, and established. Mr. Hicks assured me that beyond Canyon Gulch, a point about 15 miles from Camp No. 17, little cutting of trail would be required, so it was reasonable to hope we would reach the Matanuska camp, estimated at 80 miles from us, by August 6. This day we rested at Camp No. 17.

On July 13 Hicks located 5 miles of trail in advance.

On July 14 bridges were built across two streams, 1 mile and 2½ miles from camp, respectively. About noon of this

day Privates Blitch and Ayers arrived with orders and instructions from you, dated Knik, July 9, from which I learned of the status of Chief of Scouts Kelly and your wishes regarding my waiting at Canyon Gulch until I heard from you, which, the orders stated, would not be later than ten days from receipt of message, or on the 24th. I realized you had failed to receive my message of July 1, which detailed fully my reasons for desiring to advance beyond Canyon Gulch, and I felt that had you received this letter yours of the 9th would have authorized me to advance at once. This letter was in Private McGregor's possession when the Indian Jim, carrying my answer to your orders, passed him. But he did not give Jim my letter of the 1st, and McGregor reached Knik after you had left. All these things I realized fully and felt undecided as to my future plans, but believed you would sanction whatever seemed best and most reasonable, were it carrying out the orders received or not. I felt it an impossibility to make each other fully comprehend the other's position, separated by nearly 80 miles of difficult trail. The conviction, which had grown almost to a certainty in my mind, that the Government would send no more animals and you would not be able to procure more, led me to formulate my plans without any idea of assistance by additional animals from you or the possibility of you advancing with any to me. To this end I expressed myself fully in my reply to yours of the 9th by Private Blitch, and expected an order by an Indian runner to go ahead before the 24th.

On July 15 we took five days' rations and our beds on our backs and started to locate, cut out, and establish a trail to Canyon Gulch. We made 8 miles through rain and mud, and 7 miles on the 16th brought us to the foot of Canyon Gulch Hill.

On July 17 we established the trail up the hill and gulch some 2 miles. To the foot of the hill the trail was practicable, but beyond that difficult. Hicks assured me that if the trail beyond Canyon Gulch proved all right, that part of it could be joined to a continuation of our present trail up the Matanuska, but we could not go on up the Matanuska now, because the trail would have to go through burned and fallen timber, requiring so much chopping that we could not hope to get through this season, if we attempted it. For this reason I looked up the trail going up Canyon Gulch and consented

to have it run up this stream, not because I deemed it practical, but to save time, which I believed was precious to us.

On July 18 we returned halfway to Camp No. 17. On the 19th we reached Camp No. 17 about 8 p. m. It had rained every day during our absence. There was nothing to do now but await orders from you or the arrival of the pack train, and move to Canyon Gulch. The rain continued on the 20th, 21st, 22d, 23d, and 24th of July. It seemed an impossibility for the pack train to reach me by the 24th, yet Corporal Young arrived about 9 p. m., having four animals and the rations required. He reported that one mule gave out on the trip down, and that he abandoned it between Moose Creek and Knik. This was what I feared would happen long before it did, as the animals were a sorry looking outfit when a week out from Knik in June, and the work they had done since that time had not improved their condition. They were all covered with saddle and cinch sores, although due care had been used in saddling and packing them, as far as I could determine.

July 25 was spent at Camp No. 17, resting the animals and awaiting orders from you, Corporal Young having brought no news, orders, or mail, except that a Government vessel was in Cooks Inlet and had on board several officers of Captain Abercrombie's party, who were returning to the States. The Corporal intimated that this boat was to take you and your exploring expedition back also. It was a great disappointment to all of us not to get any mail or news of the war. These things strengthened my conviction that you would go back to the States, as the ten days in which I was to hear from you at the lakes were already past. I determined to make my way to Canyon Gulch, as your first orders required, expecting that a messenger from you would overtake me before I got there.

On July 26 we left Chief of Scouts Kelly at Camp No. 17, with fourteen days' rations and permission to explore toward the Sushitna, and left camp at 6 a. m., carrying nothing but rations on the animals, each one of us with at least 40 pounds on his back. We followed the trail we had located previously, a little north of east, crossing by bridge two creeks in the first 2 miles, and then turned east up a treeless hill and over it into the valley of a creek coming from the east into Boulder Creek, which came from the northeast out of the mountains,

between us and the Sushitna. Crossing the small creek, we followed our previous trail, now soft and boggy from the rains, passed two small lakes to a low pass, over it, passed another small lake, and down the bank of its outlet stream. Turned a little south of east, crossed several small streams coming from the mountains, distant on our left about 2 miles, emerging from the pass between them and the foothills on our right, which extended to the Matanuska River, distant about 4 miles; then out of the pass a little more to the south, over foothills cut up by streams from the mountains on our left. Went into camp about 6.30 p. m., on the bank of a small creek flowing from the mountains to the Matanuska. Distance made, about 7 miles. The animals were up and down all this day, and the work was very hard. No less than fifteen times were the animals loaded and unloaded, hauled out of the mud, and urged on only by great efforts. At several of the steeper ravines crossed all were unloaded, their packs carried to the bank above, and even then two of them made the farther bank with difficulty.

On July 27 we left camp at 7 a. m.; traveled a little south of east over trail previously cut; crossed five small streams and as many hills in the first 4 miles. The animals fell into the mud repeatedly. We then turned east and north of east over three more sparsely-wooded hills and as many creeks for another mile. Turned south of east along a creek for 400 yards, which emptied into a small lake whose outlet fed Canyon Gulch. Crossed creek and turned past small lake, north of east, ascending into a short, low pass between foothills, over it, and passed small lake emptying into Canyon Gulch. We then turned to northeast, up hillsides, past old log cabin, to camp on a small creek at the foot of a steep hill between us and Canyon Gulch. Distance traveled, 8 miles. The trail was still soft and boggy. The animals were loaded and unloaded frequently, wearing them and the men out. Went up a very steep hill about 1,000 feet high to Canyon Gulch. One animal was led up the hill without anything on him with great difficulty.

On July 28 we left camp at 7 a. m. Put half the loads on three animals. Wound up steep hillsides to summit, thence along the mountain 1,500 feet above Canyon Gulch below us, but had to halt at the end of 1 mile to bridge a bad washout made by recent rains. In another mile descended into, across,

and out of a canyon about 1,000 feet deep, made by a stream emptying into Canyon Gulch 600 yards from trail. Everything was unloaded and carried up and down these washouts. The animals unloaded fell repeatedly. After a hard day's work we made about 2½ miles, camping on farther bank of last canyon at 5 p. m. If the trail had seemed impracticable before the rains, it was now doubly so. But Hicks assured me we were gaining time by going this way, and to attempt to go on up the Matanuska and over it into the Copper River country was to lose the whole season, on account of the fallen and burnt timber in the way.

On July 29 we left camp at 6 a. m., going east of northeast. We were still about 1,000 feet above Canyon Gulch, water 800 yards to our right. Gradually winding down steep slopes, we came to bed of Canyon Gulch, where creek entered from northwest, about 1½ miles from camp. Canyon Gulch is a clear, swiftly-flowing stream, coming from northeast for about 10 miles, then turning to the south for about 7 miles to its junction with the Matanuska, the last 12 miles in a narrow canyon between mountains 5,000 to 7,000 feet high. Turned northeast up bed of stream, crossing and recrossing to bars. Five miles from camp a stream entered from the right, 1 mile farther up from the left, and in the next mile two small ones from the right. Here the stream had left the canyon and was flowing through a valley about a mile and a half wide. Gently-sloping hills rose on each side to the mountains, which were now about 6 miles away. We had now passed above the timber line. About 10 a. m. two of the animals began to weaken and refused to go on, in spite of urging or blows. Their loads were shifted in part to our backs and on the other animals. Another hour's travel witnessed another breaking down. One animal was relieved of his heavy packing material and all provisions. A cache of 50 pounds of flour, 40 pounds of beans, 25 pounds of dried apples, some coffee, and onions was made from the loads of these two animals, who seemed about to give up. Each individual had more provisions added to his pack, and we tried the trail again. We were ascending gradually to the divide at the head of the creek. The animals fell often, although the trail was not difficult. At 5 p. m. we went into camp at junction of small creek from northwest with Canyon Gulch, just below a lake about three-quarters of a mile long and about a mile and a half from the divide.

The distance traveled was about 9 miles. Poor camp for wood, but plenty of grass and water. Hicks killed a caribou about 10 p. m. and brought in about 60 pounds of it.

On July 30 we broke camp at 7 a. m. We proceeded northeast, past a lake, and into an upland meadow. Passed several small lakes, over summit and down stream flowing to the northeast, following it for 1¼ miles; turned away to north from creek, over moss-covered, treeless hills, descending to timber line, from thence west of north, winding down steep slopes, to Caribou Creek. We followed it northwest for a mile and a quarter, and camped about 2 p. m. We went into camp early to enable Hicks and the Indian to find a way out of the creek bed to the northeast. Caribou Creek is a swiftly flowing, muddy stream at the camp. It came for 30 miles from the mountains, between us and the Sushitna, in a southeasterly direction. It turned to the east 1½ miles above us and continued south of east for 15 miles below us, where it entered the Matanuska. A mile and a half above us a stream of glacial water entered it from the west. The main stream to this point was clear and full of black sand, with plenty of quartz rock on bars. A glacial stream, Suitna Creek, from the west, led to a divide, thence to a Sushitna tributary.

On July 31 we left camp at 6 a. m. We followed Caribou Creek west for 400 yards, crossed it and continued up north bank. We crossed Billy Creek, coming into Caribou from northeast, about 1,200 yards from camp. Four hundred yards farther we wound up a steep hill to the east, then turned to wind northeasterly above timber line for 2 miles. Turned southeast to wind down into the bed of Billy Creek, over steep slopes. Turned northeast up bed of Billy Creek, crossing and recrossing over bars. At a distance of 2 miles turned north, following the stream. The hills on each side sloped more gently, the valley widening. Went into camp at 5 p. m. on bank of stream, above timber line. Used the usual wood to be found in such places—short bushes. The distance traveled was about 9 miles. We found the country more open; mountains to both sides of the creek about 4 miles away; sheep on the mountains to the east of us.

On August 1 we left camp at 6 a. m. Traveled north, up bank of creek, crossed it at a distance of a mile and a quarter to follow a tributary to the northeast. The main creek came from the northwest, up which, the Indian Billy reported, it

was two days' travel to the big lake of the lake region, Lake Louise, between Sushitna and Copper rivers. We followed tributary for 1 mile, turned out of it to the east, went up a steep bank, going over an upland meadow country, forming a divide, to Copper River water. We passed two small lakes, and followed outlet water of one draining into Copper River, which entered into a creek coming from the south between high banks. Crossed it and followed downstream on high bank to the north for about a mile and a half. Turned to east up one of its tributaries, now dry, in 2 miles, and climbed out of its bed to a divide between it and a creek coming from southeast. Followed up this creek southeast to find suitable place for crossing. Crossed it in three-quarters of a mile, turned northeast down opposite high bank, winding down to bed of stream, in a mile and a quarter. Continued east and south of east on bars of creek—Sladen Creek. Went into camp at 5.30 p. m.—Camp No. 24 from Knik camp. We had now left the mountains behind us; the creek valley broadened between gently sloping hills covered with brush; no timber. Distance by trail, about 12 miles.

On August 2 left camp at 7 a. m. Proceeded down Sladen Creek in an easterly direction. Hughes Creek entered from the southwest in a mile and a half. One mile up it to Hecht Creek, which enters Hughes Creek from the south. We found rolling hills to right and left, covered with brush, creek valley broadening. Turned north of east down Sladen Creek from mouth of Hughes Creek for three-quarters of a mile, then east for 2 miles, then northeast for 2½ miles, following winding of creek to its junction with Bubb River, which comes from the northwest out of the mountains between us and the Sushitna River. We continued down Bubb River on banks and bars in a direction a little north of east. The river valley is broad, flanked by low, brushy hills. We struck timber 3 miles from the mouth of Sladen Creek, river running past several high bluffs and hills on north bank. From the mouth of Sladen Creek to north rolling, brushy hills were visible as far as the eye could see, evidently good for traveling. Went into camp on river bank at 5 p. m. Animals gave out, having fallen repeatedly during the day, on account of the soft ground made by the rain, which fell all day. The distance traveled was about 13 miles. The site was a former Indian camp.

August 3, left camp at 7 a. m. We followed Bubb River to the east, passed mouth of creek, entering the river from the south in a mile and a half. We turned away from river to avoid thick brush, and continued over a burned-out tract north of east. Turned south to the river, and went into camp at 11 a. m. on its bank. The distance made was 3½ miles. Camped early to await the return of Hicks and the Indian, who had gone to see the Matanuska Indians, and also to make protectors for the animals' ears from the ravages of the little white-legged flies, which were proving very annoying. Intended to make bend of the river 2 miles below, but the flies and a hesitation to proceed farther east when I wanted to go farther north made me camp at 11 a. m. Hicks and the Indian returned about 8 p. m. The former reported few signs of Indians at the lake, where they were supposed to be fishing, and which he saw from the top of a ridge at a distance of about 5 miles. He had complained the last few days of feeling unwell, and seemed desirous of turning back, taking little interest in the work. At Boulder Creek, on July 8, he had expressed a desire to return, and with great difficulty I persuaded him to remain. He gave as his reason for wanting to go back then that he felt we could not get through. He seemed to be subject to the "blues," and easily lost heart. I did my best to retain him, as he was almost indispensable and the only interpreter we had. I afterwards found I could get along without him, but at this time his services seemed invaluable.

August 4 we left camp at 8 a. m. in a heavy rain. Went east down Bubb River, crossing to south bank in 300 yards. Followed it for 1¾ miles to where the river turned due south and flowed into Lake Plaveznie, whose outlet stream, the Taxlena, flows into Copper River. We estimated Lake Plaveznie at 20 miles from the river bend. Crossing river, we continued east over marshy land for three-quarters of a mile, then wound up steep hillside, and continued east and south of it for about 6 miles, over a mossy, swampy, burnt-out tract—knolls, ridges, lakes, and marshes alternating—gradually ascending to the summit of the ridge, from which we could see the lake at which the Indians were supposed to be, and which I called Upper Lake Plaveznie. From the summit of the ridge I turned northeast to wind down gentle slopes, crossing numerous marshes and small creeks. In 2½ miles passed an Indian

cabin, turned south of east from it to follow an old Indian trail, over marshy, swampy ground, for about a mile and a half. We went into camp about a mile and a half south of the lake, which was separated from its shore line by an impassable marsh. One Matanuska Indian came into camp and informed us there were few Indians about, and that the Matanuska chief would be at the lower end of the lake next morning, being on his way from Lake Plaveznie to the mountains to hunt.

On August 5 left camp at 8 a. m., going south of east and south, then southwest, in the first mile and a half, to get around marshes. We then turned north of east and crossed several swamps, striking good Indian trail around lower end of lake. Ascended low ridge and descended to cross outlet stream of Upper Lake Plaveznie, on the opposite side of which, at an Indian cabin, we met the Matanuska chief, Andre, his wife, and a half dozen other Indians. After a short talk we continued up the bank of the stream northeasterly. We went into camp at 10.30 a. m., the object being to get sufficient Indians to pack provisions to the Tanana, sending Corporal Young and Packer Dillon back to Knik with animals. The Indians were invited to partake of tea, sugar, and bread. Two photographs were taken of the group while eating. The chief got angry with Mr. Hicks over a previous flour transaction, and left in a temper, the other Indians coming and going the rest of the day. Little success was had in obtaining Indians to pack, only one consenting to go for five days. The Indians were engaged in catching salmon in the outlet stream from Upper Lake Plaveznie at this point, intending to leave soon for the mountains to hunt caribou. Hicks asked once more to be relieved, when I told him I intended to go ahead, Indians or no Indians to pack. He stated he was worn-out, and that he did not want to starve to death, as he felt we would if we advanced farther with the worn-out animals we had. I decided to let him go, and ordered Packer Dillon to accompany McGregor, the Indian, and myself, sending Corporal Young and Hicks back to Knik with about eight days' rations, counting on their reaching camp on Boulder Creek, where Chief of Scouts Kelly had been left, and also five days' rations for two men. Packer Dillon refused to go with me, claiming he could quit when he felt like it, and that he had the rheumatism and could not stand the trip. After a short conversation he was induced to become one of our party.

We were now about 165 miles, by trail, from Knik, and about 85 miles from Camp No. 17 on Boulder Creek, which we had left on July 26. The progress made in the last ten days was very encouraging. If we could find as open a country to the front as that we had just passed over, and the animals held out, I felt no fears about reaching the Tanana, as I could make out at least 40 miles of good traveling ahead of me, on a long wooded range which ran off to the north toward the Alaskan range. I had given up all hope of hearing from you, when we got no word before leaving Canyon Gulch, a week after a message was due from you, at the latest. I had concluded that you had left for the States, and intended to leave me to do as seemed best, as one of your orders asked me to state whether I would remain if the expedition was ordered back, and I had replied in the affirmative, as I wished to complete the task I had worked so hard to successfully start. In leaving Canyon Gulch a week after orders from you were due, I felt that I was doing what was best, for the season was short and time very precious. We had only just started on our long journey, our provisions would in all probability get very low before we could get more, and to wait longer for news from you, sitting down to eat the rations we had worked so hard to get to this point, seemed to me very unwise and foolish, and would compel us to turn back, if in the end we did not hear from you, without accomplishing anything. The conviction in my mind that I would not hear from you again, more than anything else, decided me in making the advance without further waiting. For these reasons I had continued to advance to the Matanuska camp, intending to carry out the plans I had previously outlined in letters to you, and which I felt you would have approved and ordered carried out had you received my letter of July 1 in season.

On August 6 we left camp at 8 a. m. and proceeded northeasterly along the outlet stream of Upper Lake Plaveznie, following Indian trail. Turned more to north in 1 mile, followed trail on banks of lake for 1¾ miles, continuing past several Indian camps at head of lake, over a marshy tract, then northeasterly up a wooded ridge, finding a burnt-out tract at the summit. Here we left the Indian trail, going south of east to Copper River, continued northeast over burnt tract, passing by numerous small lakes and over marshes and knolls burned out. Twelve miles from camp we passed by the large

lake—Lake Louise—of the lake region between Sushitna and Copper rivers. It drains into the Sushitna. Turned east of northeast to avoid marshes of big lake, which was distant about 4 miles on our left, and camped by small lake at 5 p. m. Distance made, 14 miles.

On August 7 we left camp at 7 a. m. We went almost north over ridges, knolls, and swamps, passing numerous lakes. Mules fell repeatedly on the 6th, and after making 5 miles had to go into camp at 12.30 p. m. on the 7th, as one mule fell and could not be moved in spite of all we could do.

On August 8 we left camp at 7 a. m., going due north, over same character of ground as on the 6th and 7th. After falling repeatedly, the mule which had given out on the 7th fell, and refused to move. About noon we decided to abandon him, as we were losing time by keeping him and could get along without him. We put part of his load on our backs, part on the other animals, and continued due north for about 11 miles. Went into camp by small lake at 4.30 p. m., as all the animals were falling in mud holes frequently, and one in particular seemed about worn out.

On August 9 we left camp at 8 a. m., going due north, over the same kind of country as on the 6th, 7th, and 8th, for 11 miles. Went into camp at 4 p. m. From our camp we had a fair view of the country about us. As far as could be determined, we seemed to be in a great tract of country, bounded on the east by the Copper River Valley, on the north by the Alaskan range, on the west by the Sushitna River and the mountains between it and the country north of the Matanuska, and on the south by Bubb River and the Plaveznie Lakes, with tributaries and outlets. This country was cut up by numerous wooded ridges, from 100 to 1,000 feet in elevation, running in all directions, cut up and separated by thousands of small lakes and marshes, draining to the Sushitna and Copper rivers. The ridges were well timbered with spruce, fir, hemlock, birch, and cottonwood, and the marshes were frequently open; both had often been burnt over, making good traveling. The lakes were generally shallow, and the breeding places of many ducks and a few geese and swan. Signs of moose were plentiful in this region, and caribou were seen near Lake Louise. The large mountains, Wrangell, Sanford, etc., were visible across Copper River. The range of mountains which runs nearly north and south between the

Sushitna and Matanuska countries continued to the north between the Sushitna and the lake regions, gradually getting lower and ending about 60 miles from the foothills of the Alaskan range. Through the open space thus formed the right-hand fork of the Sushitna with its tributaries flowed southwesterly from its source in the Alaskan range. Behind us the mountains south of the Matanuska, and between it and Prince William Sound, continued from the head of the Matanuska to the Copper River Valley. Between the Matanuska and Bubb rivers the country was mountainous to a degree, but the mountains were frequently isolated, and passes between them permitted movements in all directions. To the north could be seen the lofty Alaskan range, running nearly east and west. Passes were visible at the head of Copper River, and almost north of us, and again to the northwest. Elsewhere the range presented a very rugged and glacial appearance.

On August 10 at 8 a. m. we left camp, going north toward the pass in the Alaskan range, and over the same character of country we had passed during the last few days. After going about 6 miles, we turned due north; but we had to go into camp at 3 p. m., as the animals were played out. Two of them could not be urged to make an effort. At the end of each day's march it seemed the animals would never be able to make another mile. At the first appearance of mud they would give up and fall, and have to be unloaded. After continued hauling and beating they were gotten out of the mire, reloaded, and urged forward. This would happen from ten to fifteen times a day, until our strength and patience were completely exhausted and the animals unable to move at all. So slowly were we advancing, that I had to order half rations, as it was impossible to judge what we had ahead of us.

On August 11, after spending two hours hard work digging one of the animals out of the mire, we left camp at 9 a. m. Traveled as straight for the pass in the mountains as the small lakes and marshes would permit, our course being about northeast. If anything, the falling of the animals was more frequent this day than before. At 3 p. m. we had made 6 miles and had to go into camp, as one of the animals could not be moved ahead. As our stock of provisions grew smaller each day, I frequently felt like leaving an animal when he caused us to go into camp. But I was not sure the next

day's work would not compel us to abandon another, and we needed more than one animal; with three in use, we were carrying all we were able to on our backs. A mule called "Kid" had about 250 pounds on him and did wonderful work, extricating himself frequently when mired. The horse we had carried about a hundred pounds. A she mule, noted for her bucking and general cussedness, carried about 75 pounds. With these light loads they were falling from daylight to dark and made no effort to get out and help themselves.

On August 12 we left camp at 7 a. m. Traveled east of north, avoiding small lakes and swamps. We descended from a small ridge and crossed Stetson Creek, and in another mile Andres Creek, both tributaries of the Gakona River, the latter a tributary of the Copper River. We had reached the foothills of the Alaskan range, and found a good Indian trail coming up the Gakona River and following up the course of Andres Creek. After crossing Andres Creek we wound up a steep hillside, following the Indian trail to the northeast. At the end of two miles it forked; one trail turning to the east and going to the Upper Tanana, the other going to the northwest to the Sushitna and Lower Tanana. We followed the latter along the ridge, scantily timbered, above Andres Creek. Went into camp near an old Indian camp about 4 p. m., about 1 mile west of a lake. We had traveled about 6½ miles.

August 13 we left camp at 7 a. m., going northwest above Andres Creek. In 300 yards we descended into the valley of a small creek, tributary to Andres Creek. No effort could get the mule "Fannie" up the gentle slope out of the bed of this stream. She fell and seemed worn-out. I went into camp at 9 a. m. to give her a chance to recover. A Copper River Indian and his little son came into camp, having come up the Gakona from Copper River in three days. I hired him to pack to the Tanana, as we seemed about to lose all of our animals.

On August 14 we started at 8 a. m., going almost north up the ridge above Andres Creek. We crossed a small creek in 2 miles and turned down into the valley of the Andres Creek 1 mile beyond. Continued north up Andres Creek, going into camp at 5 p. m. We had made 9 miles, and were now getting well up into the foothill country. The summits of the hills were bare of timber.

On August 15 left camp at 8 a. m., going due north up Andres Creek for three-quarters of a mile, where we turned out of the stream which came from the east out of Lake Blanche, distant 5 miles. Continued north over marshy slopes, crossing small creeks, and ascended a long, gentle slope over a low divide into a lake region above timber line. Rain fell all day. We made camp at 4 p. m., on the bank of a deep meadow stream, which flowed to the east into Copper River. We had great difficulty in crossing this stream. We had made 7 miles. There were no timber bushes for wood. About 2½ miles from camp we crossed Indian trails going from the Sushitna to the Upper Tanana, and to the head of Copper River. We seemed to be in a great elevated plain in the Alaskan range, which extended far to the east, west, and north of us. There were numerous isolated mountains rising from its surface.

On August 16 we left camp at 8 a. m., and traveled nearly northeast over marshes and rolling hills. In 2½ miles we followed an Indian trail, on a ridge above the lake, about 2 miles long. Leaving a creek flowing to the northwest into the Sushitna on our left, we turned to the north at upper end of the lake and wound then to the northeast between numerous lakes and marshes, crossing Beaver Dam Creek, a tributary of the Tanana, 8 miles from camp. Continued northeast over brushy hills and swamps, and crossed Duncan River and camped at timber line at 6 p. m.—Camp No. 38 from Knik camp. We had made about 12 miles. It rained very hard and the Indians did not get into camp until next morning. We were now on the Tanana side of the divide, and we were assured by the Indians that we would reach the Tanana in about two "sleeps."

On August 17 left camp at 9 a. m., going northeast over ridges and marshes. We passed numerous small lakes. Crossed Duncan River and followed east of northeast down its south bank, on a ridge about 150 feet above the stream. The Duncan River was almost one continuous lake at this place. Coming from the north out of the mountainous tract and joining it 4½ miles from camp was Gregg River. We continued on ridge above Duncan River, and crossed two tributary creeks and went into camp at 4 p. m. Distance traveled, about 9 miles. Timber was scarce. We were assured by the Indians that on the morrow we would reach the Tanana.

On August 18 left camp at 8 a. m., going northeast on ridge above Duncan River. Winding between lakes we left the river, which turned to the north to flow between mountains, in a mile and a half, and turned to the northwest to ascend an elevated ridge which, the Indians told us, was a divide to Tanana River. We followed up the creek coming down ridge, passed a lake over the summit, passed another lake and followed its outlet stream down the ridge on the north side. Camped near the Delta River. We believed the Tanana was a few miles distant, as the Indians assured us. The Delta River came from the southwest out of a mountainous, glacial region, and the Duncan River emptied into it about 3 miles above camp. Rain fell all day. Coming over the ridge we met an Upper Copper River Indian hunting caribou, who informed us there was a camp of Indians on the river a short distance from our camp. Still believing we were near the Tanana, I discharged the Indian who had been hired to pack to the Tanana. The one whom we had engaged at Upper Lake Plaveznie continued with us, with the understanding he was to get my shotgun if he helped us to reach the Yukon. Engaged the Indian whom we met hunting caribou to help us to reach the Yukon.

On August 19 we remained in camp, resting and repairing.

On August 20 we traveled northeast, down the eastern bank of the Delta River, passing Indian camp in 1 mile. There were three families of Upper Copper River Indians in this camp engaged in hunting caribou. The chief came out and presented us with a dried salmon, but got nothing from me in return, as I had discovered the deception practiced on us with reference to the location of the Tanana. Our Knik Indian, Billy, was useless in interpreting, as he had proven himself in everything else since we started from Knik. They seemed to enjoy our ignorance with reference to the geography of the country and told us many lies about it. To punish them I gave them nothing but tea and coffee at meals. This I had agreed to do, but had permitted them to have a little rice heretofore, as we had an abundance of this article in comparison with our other supplies. Continuing northeast over the hillsides adjacent to the river, 3½ miles from camp we ascended an elevated ridge, leaving the river, flowing to the north, between canyon walls. We continued northeast over ridges above timber line, through a heavy rain, and

descended to cross Bernard Creek, which entered from the southeast out of snow-capped mountains. Went into camp at 6 p. m., having traveled 11 miles. From the hills we could see, far to the east and west, the rugged, snow-capped peaks and glaciers of the Alaskan range. The Delta River cut through it in its course to the Tanana. Many glaciers terminated at the river bank, their terminal moraine making difficult ground to travel over.

On August 21 we left camp at 8 a. m. and traveled northeast over bars in river bed. We crossed Stagsdal Creek, a glacial stream from the east, 2½ miles from camp, and turned north, following the river bank. Crossed Raibourn Creek 4½ miles from camp. One hundred yards farther we encountered Glacier Creek, a deep and very swiftly flowing stream, which came from a glacier three-quarters of a mile from the river. After several attempts to cross, our worn-out animals having been rolled over each time by the current, we were compelled to go over the glacier with them. It was a risky undertaking. Rained hard all day. We camped at 4 p. m. to give ourselves and provisions a chance to dry out. The animals were steadily getting weaker. We were losing strength each day from lack of food.

On August 22 left camp at 8 a. m. Went north down bank and over bars of river. Two miles from camp we were compelled to climb a steep hillside. The mule "Fannie" refused to go up or down when halfway up the hill. Nearly two hours were spent in an attempt to get her to go ahead, but all our efforts were in vain. Three Indians and two white men pulling on a rope tied to her jaws, with a liberal application of club by a white man behind her, could not induce her to move. How many times this mule had balked at hills great and small and been pulled out of swamps, while other animals crossed with ease, loaded and unloaded, would be difficult to state. I felt we were using our own strength, now none too great, and being unnecessarily delayed now, as we had been many times before, by this animal, we killed her. Being short on provisions, we took about 25 pounds of her meat and found it very palatable. Putting some of her light load on our backs and the rest on the remaining animals, we continued north, through the rain, over the bars of the river, for 2½ miles, when we were compelled to break through the thick brush on the river bank and adjacent hillside for about

2 miles. We went into camp at 4.30 p. m. Distance made, 6½ miles. Some sheep were seen on a mountain a few miles ahead of us and the Indians went in pursuit of them, returning about daylight on the 23d with part of one sheep.

On August 23 left camp at 8.15 a. m. We traveled a little east of north on brushy hillside, above swiftly flowing river. We passed mouths of Holley and Brown creeks, which came from glacial mountains northeasterly into Delta River. Emerging from the brush, we crossed a small creek 1 mile from camp and entered meadow land near the river bank, and found remainder of sheep cached by the Indians 1¾ miles from camp. Picked it up and continued east of north down the river bank. We ascended hills through very thick and difficult bushes and fir trees, following an old Indian trail which wound dangerously near the high river bank. In attempting to follow the mule over this trail the old horse, weak and staggering, a wreck of skin and bones, stumbled and rolled into the icy flood below. I was ahead about 400 yards, keeping an eye on the two Indians who were packing for us, fearing they might run away with most of our food. The Indian Billy, who was leading the mule "Kid," came up to tell me of the mishap to the old horse, and to get an ax to cut a passage for the mule through the thick brush. I returned to the old horse, which Dillon and McGregor had unloaded as best they could, leaving two of the Indians in advance with Billy, about 200 yards away, cutting the trail. We struggled for half an hour to get him out of the quicksand and glacial water, but he was so weak his small efforts hindered rather than helped him. With many regrets I killed him to keep him from drowning, which would soon have been his fate. The loss of this animal cast a gloom over us all, for he had been faithful and honest in all his work from first to last. How many times we pulled him out of mud and mire, he always doing his best to help us, will never be known. How often the tinkling of the bell hanging about his neck had been a most welcome sound to all, men and mules. Many times, before and after his death, fancy and thoughts of him made us imagine we heard the tinkling bell when he was miles away.

With the help of one mule we could not advance, so I determined to build a raft, kill the mule, take plenty of his flesh, and float down the Delta to the Tanana. There, from the

many stories I had heard or read of the numerous Indians and miners along this stream, I hoped to get supplies, to reach Circle City, or, failing in this, to float down the Tanana to civilization. Returning to a good camping place about a quarter of a mile up the river from the old horse, I directed Dillon to go ahead and tell the Indians to return to camp. In an hour Dillon, McGregor, and the mule returned, and the men reported the Indians had left their packs in the trail and vamoosed. This I had feared for several days, but was thankful they had left the rations. Dillon reported going beyond about a mile, but saw nothing of a tent, handkerchief, and knife which belonged to me, and which they had when they went away. Even with these articles in their possession, we were in their debt, as they had engaged to pack for $2 a day and had not been paid. I made no effort to follow them, being rather glad of their departure, on account of the numerous lies and vast amount of false information they had given us in reply to our questions. We set to work with a will, chopping down trees, and by evening of the 24th of August our raft was complete, save the superstructure. Intending to put this on, kill the mule, and embark next day at noon, when the glacial stream was highest, we were all in good spirits. The novelty of a new means of locomotion and travel pleased us, after nearly three months of shank's mare through mud, quicksand, moss, mountains, glacial water, gnats, flies, heat, and mosquitoes.

August 25, about 6 a. m., I was awakened by strange voices to find Private Cantwell and the Knik Indian Stephan in camp, with a message and orders from you. From the former I learned of the presence of three Indians camped about 2½ miles behind us, and determined to go back and get my tent, knife, handkerchief, and Billy, who I felt was one of the party. Leaving Dillon to begin cooking a good, large meal, something we had not dared to indulge in for weeks, Cantwell, McGregor, and myself started for the Indians, followed at a distance by Stephan, who would not give up his rifle to McGregor. The rifle I had was useless, as it could not be cocked, but the Indians thought it was all right, and I felt we would have no trouble, knowing their cowardly natures. Cantwell guided us to their tent and Billy was brought back. The others got a few profane words for the packing they had done and the assurance of a good hanging if they did not make themselves scarce. We found Stephan had already

done this. We returned to camp and remained the balance of the day, cooking and eating. Billy brought in the tent and other articles, which the Indians had left some distance in advance on the trail.

Your arrival in the evening was most welcome to all—greatest to Dillon, perhaps, who could not satisfactorily solve any equation having raft, river, buoyancy, man, or floating power as factors. It was a new experience, and like a summer holiday, to break camp next morning as late as 11 a. m., after eating all we desired, and advance without packs on our backs, and to see your fine, sleek animals make sport of the trail our poor beasts would have floundered and fallen over. We continued nearly north over the thickly-wooded, steep hillside, sometimes following the Indians' trail. Crossed three small creeks. At the end of 2 miles we descended to the bars of the river bed, and went over these north of northeast, crossing a small creek 4 miles from camp. Continued over flat meadow land and through bushy stretches, crossing creek 8 miles from camp, turning up on steep hillside to avoid bluffs ahead. Passed several small lakes and wound down gently sloping burnt-over hills, in old Indian trail; crossed outlet stream of lakes. We made camp in short firs, on small rise, near creek flowing into river 200 yards away, which was half a mile wide and full of sand bars.

On August 27 we were delayed by some animals taking back trail and did not leave camp until 4 p. m. We traveled north of northeast over gently sloping, wooded hillside for 2¾ miles. Crossed four small streams which flowed through boggy bottoms, halted, then turned back on trail for a mile, and went into camp near small stream in mossy tract, the country along the river in advance being reported impracticable by Mr. Hicks.

On August 28 we left camp at 8 a. m. Traveled northeast up gently sloping hillside and continued for 3½ miles, above timber line. Turned more to the north and passed several small lakes, over small bushy rises and summit of low divide. Left bare butte to our right, descended, and, turning, moved to the north along high bank of dry stream. Crossed the bed of the stream and turned west of north to a series of wooded ridges, then turned and followed on top of same north of northeast and descended. Went into camp by small lake, which was one of a series, about 5 p. m.

On August 29 the party divided. Some went back over the trail to await the return of yourself and party from Tanana. The Tanana party left camp about 11.10 a. m., going north of northeast over wooded ridges and through elevated wooded tracts, striking high bank of dry stream which flowed in wooded river bottom, about 10 miles from camp. We followed the bank and descended the same to the dry creek bed, which we followed west of north toward the river. Crossed the creek, now flowing water, at old Indian camp, and turned more to north, over wooded bottom land, and forded Separation Creek near its junction with the Delta River. Continued down the east bank of same through thickly wooded, mossy tract, camping on same about 6 p. m. The camp was poor, with little grass. The distance made was about 15 miles.

On August 30 I left your command at 10 a. m., with orders from you to proceed to Circle City and thence to Vancouver Barracks, Wash., accompanied by Privates Blitch and McGregor, Fourteenth Infantry. We had mules "Weyler" and "Jack," and twenty days' rations. We proceeded northeast, down the bank of Delta River, through thick stunted fir and deep moss. In 600 yards turned down to river bar, over this for a mile and a quarter; then, turning away from the river bank to avoid moss and thick spruce, we traveled over a burnt-out tract for about 4 miles. Turned north of west to river bank, down it, and over bars in good Indian trail to the Tanana River at 3 p. m. We had traveled about 11 miles. At this point the Delta entered the Tanana by about six channels, with a width of about 1,200 yards, the Tanana being about 150 yards wide, with a high bluff on the side opposite the mouth of Delta River. About a mile above the mouth of the Delta we found a deserted Indian cabin, across from which a small slough made an island. The river was about 200 yards wide, and a very muddy, glacial, deep, swiftly flowing stream. Up the high south bank of the Tanana was a well-traveled Indian trail, but for 4 miles and more above the cabin the river was divided into several channels by numerous islands. The best place to cross we found opposite the Indian cabin. Without a single nail, and with the assistance of strips of moose skin, we had constructed a raft of four logs about 16 feet long and 1 foot in diameter by 3 p. m. of August 31.

At this time Private Blitch, myself, rations for two meals, mule "Weyler" and mule equipment, embarked in a heavy

rain. After very hard work we landed on the opposite side above the high bluff. We worked until 8 p. m. trying to get the raft back up the stream in order to make the cabin where we had embarked. But we had to go into camp in the rain, while Private McGregor remained on the opposite side in the cabin. The next morning hard work got us across and up to the cabin without getting into Bates Rapids, below the mouth of the Delta. Unfortunately, I lost an ax and hatchet in cutting brush along the bank to enable the raft to be towed up stream.

On September 1 we embarked at 4 p. m. with all our impedimenta and everybody on board. The mule "Jack" was tied closely behind. About 40 yards from shore the struggles of the mule listed the raft, and we were fortunate to reach the bank we had just left without losing anything. We camped on the south side determined to add two logs and try it on the 2d.

On September 2, just as we were about to start, we discovered two white men on a raft passing the mouth of Delta River. Our shouts caused them to land on our side below the stream. With the aid of $2, Private Blitch induced one of them, a Mr. Taylor, to come up and see us. He informed us he had come from Dawson by the way of Forty-Mile, Lake Mansfield, Ketchumstock Hills, and the Tanana River. He had lost three rafts in timber jams and had been resuscitated from drowning three times by his partner. He had been up the Volkmar River 50 miles. As he found no trail on either side, he was on his way to Weare. He had no hat, coat, or shoes. I gave him a little tea and salt, of which we had plenty, and a message to you. He joined his companion and they watched us while we crossed the river. We landed on the island, then crossed the slough with all save mule "Jack," who nearly upset the raft and had to be cut loose. The rain fell all day. After two hours' hard work we had to leave "Jack" on the island, as no amount of work could induce him to enter the ice-cold water.

September 3 was a clear day. After getting "Jack" across the slough, we dried out until 2 p. m., when we traveled north of east through thick brush and timber along the bank of slough. We climbed steep hill in three-quarters of a mile to avoid the bluffs, and kept up on the hillside all the afternoon, crossing many deep ravines and gulches. Went into camp

at 5 p. m. Distance traveled, 4½ miles. Both of the mules seemed sick. "Weyler" fell many times during the afternoon. The ice-cold glacial water gave them severe colds. Night and day they were shivering and seemed unable to get or keep warm.

On September 4 we left camp at 9 a. m., going north of east over steep hillside. Crossed deep gulches and ravines. "Weyler" continued to fall, and was frequently dragged out of the bottom of a gully, into which he had rolled, by ropes. By noon we had made about 400 yards. At 2 p. m. I abandoned "Weyler," as he fell and could not get up, and left him to die in peace. Putting his load in part on "Jack" and the rest on our backs, we continued southeasterly out of the hills to the bank of the slough, apparently having passed all bluffs. We turned northeast up the bank of the slough, but had to climb two steep hills to avoid the bluffs. At 5 p. m. we camped in the rain, having made 2½ miles. This night we went on half rations, as the beans and rice you and I had spoken of sufficient to help out the lack of flour and bacon had been left by some mistake. We had about six meals of rice and an equal number of beans when we left you. Ten pounds of our 50 pounds of flour was so lumpy we could not use it. To get the mules and our packs over the country about us, we needed double instead of half rations.

On September 5, at 8 a. m., we left camp, going almost east up bank of slough, ascending the hill to avoid bluffs, then descended very steep, rocky hillside and crossed muddy slough. Continued nearly east over swampy, mossy tract near slough, and turned south of east, striking the Volkmar about half a mile from the Tanana. Turned north of northeast, up the Volkmar, passing the forks in 2 miles. Followed old game trail along winding of river. Camped at 5.30 p. m.; distance traveled, about 7½ miles. The Volkmar empties into the Tanana by two mouths. There is an island between the two forks inhabited by Indians. It is a very winding stream of medium current, the water swampy in color and taste. The river valley is 15 to 20 miles wide, between wooded hills 500 to 1,500 feet high; the trees spruce, fir, pine, cottonwood, birch, alder, hemlock, willow, etc. We killed eleven grouse in the evening. These helped out our short rations on the 6th and 7th.

On September 6 we left camp at 8 a. m., going east of northeast. The river came from the south. Continued all day in

this direction and northeast, crossing five swamps and many hills. Camped at 5.30 p. m., in a swamp. Distance made, about 9 miles. Water was very scarce, the traveling very hard. We saw the river at intervals during the day winding east of us in all directions.

On September 7 we left camp at 8 a. m., going northeast. Crossed slough in quarter of a mile. Struck and followed the river in half a mile. Climbed over steep hillside. Left river coming from south of east and turned nearly north across swamps. Crossed very deep creek about 2½ miles from camp. Turned northeast over burned-out swamp. Ascended ridge and turned east for 2½ miles over burned-out swamps and ridges. Struck the river and followed it along steep hillside for 1 mile. Turned due north over swamps. Left river coming from the east for 2 miles; struck river again; crossed deep creek near its mouth. Went into camp at 5.30 p. m. Distance traveled, 11 miles. The mule fell repeatedly, and gave evidence of the hard work he had had since crossing the Tanana. We found short rations very poor allowance to do the hard work required in the difficult country we were encountering. Our clothes and shoes were in wretched condition. It was evident there was no trail up this river, and never had been. No sign of a trail could be found, but I had faith in the maps at our disposal. These show an open space between the Tanana and Ketchumstock Hills, about northeast of the head of the Volkmar River. Our course to date seemed to be bringing us toward this tract, which, according to the map, would give us easy traveling to Birch Creek waters, thence to Circle City.

On September 8, at 7.30 a. m., we left camp, going north for three-quarters of a mile, then northwest for a mile and three-quarters, then northeast. Crossed creek 4 miles from camp. Traveled on river bank and bars, through swamps, and over high wooded hills to avoid bluffs. Camped on river bank at 5 p. m., having made a distance of 9 miles. Camp No. 56 from Knik camp. About noon, in attempting to ford the river to avoid following its windings, I was swept off my feet by the swift current, which went over my head. Having sketching case in one hand and ax in the other, I lost the latter to enable me to swim. I was thrown against a timber jam and stunned, but got to farther bank. Made Blitch and McGregor stay on the opposite side, with the mule, at camp. Crossed on two logs, and all were together again on west side.

On September 9 left camp at 8 a. m., going northeast over swamps, river banks, and bars, and over high hills to avoid bluffs. Crossed two creeks and passed mouths of two, which entered river on the opposite side. Made 9 miles, and camped at 5.15 p. m. The mule was rapidly getting worse, falling continually, and causing us more work than we wanted in our weak physical condition.

On September 10, left camp at 8.30 a. m., going north of northeast over bars, river banks, swamps, steep hillsides to avoid bluffs. Five miles from camp we crossed river to avoid long series of steep hills and bluffs on our side. Passed old Indian camp. The mule fell, and we could not get him up. Went into camp at 2 p. m. Distance, 6 miles. Time was very precious to us, but decided to give the mule one more chance. This day he fell many times, and had no energy or ambition to go ahead. He ran blindly into trees, and seemed unable to help himself when down.

On September 11 we left camp at 7 a. m., going northeast over bars. The mule fell three times in 400 yards. About a quarter of a mile from camp he fell again on steep hill side and let himself roll into the river where it was very deep, wetting what was left of our small supplies. By means of ropes we dragged him out and shot him, as we needed meat and could not afford to abandon him. Taking about 60 pounds of his flesh and all the straps and ropes we needed from his harness, we started with 50-pound packs northeast along foot of steep bluff, climbing over rocks with great difficulty. The rain fell all day. Four and a half miles northeast and east was the best we could do. Camped at 4 p. m. The trail was so difficult it would have been impossible to have brought any animal over it, so the loss of the mule was not mourned.

On September 12 we left camp at 8 a. m., going east three-quarters of a mile, north 2 miles, east 5½ miles. Camped at 5 p. m. Our packs were proving too much for us, as our strength was far from what it usually was. Our feet were a source of great annoyance, their covering being almost gone. Bread had been made once in two days and now was being made once in three days. It was so necessary, to make a meal at all palatable, that we made the small loaf each one got once in three days last the entire six meals.

On September 13 we left camp at 8.30 a. m. Traveled east 1¼ miles, north 1½ miles, east 2¼ miles, when we had to abandon

our blankets and many other articles. Our strength was too little to carry the loads we had. Our blankets weighed more than all other things together, and, although we would miss them very much, they had to be abandoned. I now realized we must make Birch Creek and white men or Indians, else we would soon be in very desperate straits. It rained and snowed every day to add to our discomfort, and the trail was extremely rough and difficult on our almost bare feet. With lighter packs we continued east, then southeast and south, north and again east, being compelled to follow the windings of this very crooked river, which was now a mountain torrent, flowing clear and with very swift current between almost canyon walls. We were unable to ford it on account of its depth and swiftness. Went into camp at 5 p. m., having traveled 9 miles.

On September 14 we left camp at 8.15 a. m., going nearly east over bars, swamps, and steep hillsides, cutting off as much as possible the bends of the river. We made 11 miles and camped at the forks of the river. The valley of the river had now widened; gently sloping hills were on each side, the snow-capped hills being more distant. Many streams entered from each side and it had every appearance of being a divide country. Between the forks one stream came from the southeast and one from the northeast, and there was a bald mountain 3,500 feet high which promised a good view from its summit.

On September 15, after breakfast, we had enough bacon left for supper that evening and breakfast next morning, and tea and coffee for about two weeks. We left camp at 8 a. m., going up the southeast fork of the river for a mile, then turned to wind south of east up the mountain. Reaching the summit we found the southeast fork divided about 2 miles above camp, one branch coming from the south and one from southeast. North, east, south, and west all we could see were mountains 1,500 feet to 4,000 feet high, snow-capped, very steep and rugged. There was no sign of a divide or of the Yukon tributaries. We continued north of east all day over bald mountains, hoping to see a way out, but in vain. With strength all but gone, we stood at sunset on the summit of a high mountain, at the foot of which a branch of the northeast fork drained and found its source in a small lake lying in the crater of an extinct volcano. With powerful glasses I could see nothing but mountains as far as my eye

could reach. I estimated at least 30 miles, but our maps were worthless and it was impossible to say what was beyond these mountains. I knew we could not climb out of them in a week even if we were in good health and strength and had plenty of food. In our present condition, without food, or strength, or shoes, our feet torn and bleeding, and, judging from the past week, no chance to find game, it seemed to me our only course was to turn back and go down the river, which was the kind of walking best suited to our feet and strength, and try to reach the dead mule, get some of his flesh, reach the Indian cabins at the mouth of the river; hoping for aid from them or the chance of finding someone on the Tanana. With gloomy thoughts I turned down the mountain into the valley of the northeast fork, and continued down it till dark, when we camped and ate one small meal. We had worked so hard to get through, gone without food and blankets, wading through glacial ice water, were rained and snowed on, our feet torn and bleeding, it was reluctantly that I turned back when the last food was eaten. I was compelled to abandon all hope of reaching Circle City, but was satisfied that the route up Volkmar River was impracticable and that no trail had ever existed up this stream. The maps in our possession were very erroneous. Plotting our course on them as nearly as I could, it seemed we should have struck the south fork of Birch Creek long before we turned back. Since then I have learned that this stream has not half the length our maps gave it, and it has an entirely different direction. Without a guide, acting solely on Captain Ray's report and the knowledge the maps gave us, I felt we had already gone too far into this region, which is practically unknown and unexplored. The maps of this region would lead one to believe the makers of them were very cognizant of its geography. Such, however, is not the case. My experience before and since this trip up the Volkmar River teaches me that any individual who places his faith in any map of Alaska existing to-day will be badly deceived, for I have positive knowledge that they are very erroneously made in general features and the result of guesswork in details.

On September 15 all still water froze during the night. The ragged coverings of our feet became more worthless as we broke through the ice on the swampy hillsides of the northeast fork next morning. Our firearms must bring us food for dinner to-day.

On September 16 we camped on the main Volkmar about 4 p. m. in a heavy snowstorm. We were fortunate to have two little ducks for dinner. Breakfast on the 17th consisted of a cup of coffee, after which the painful march down the river valley was resumed. It snowed, but was not very cold. Fortunately, a young gray wolf was curious enough to approach very close, and after repeatedly firing at him he was killed when not 75 yards away. It was skinned; we put its flesh upon our backs, and resumed the march without losing any time. Camp was made about 4 p. m. at the place where we had thrown away our blankets on the march up the river. The blankets had not been molested and we enjoyed a good night's sleep, the first in nearly a week. The wolf proved such good eating, tasting much like mutton, that we had little to put in our blanket packs the next morning.

On September 18 a few miles over mossy, swampy hillsides proved to us that we were trying to pack more than we were able to carry. A halt was made about noon to build a raft, this means of travel promising better results than painful walking with heavy packs. Having no ax, the roots were burned from four logs and the blankets torn up into strips for rope.

On September 19 with this frail raft we embarked in a heavy snowstorm. The firearms and our scant bedding were secured to the logs and our remaining food—tea and coffee—strapped in the bedding. We went with great rapidity through 5 miles of continuous rapids, under dangerous sweepers, narrowly escaping several timber jams. Soaked to the waist by the icy water, wet through above the waist by the falling snow, we were about to stop to warm our almost frozen limbs when the swift current drove us into and under a large timber jam. I ordered McGregor to get on shore as quickly as possible. Blitch and I made a vain effort to secure the rifle or shotgun. We finally extricated our limbs from the tangled mass of roots, with great pain and difficulty. The raft remained under the jam; having no ax, we could not cut it away. Without food, firearms, shoes, coats, or blankets, we gathered around a fire of drift-wood, having kept a few matches dry. The distance of 10 miles to the dead mule was made in stocking feet, through icy swamps and over jagged rocks. What the ravens and

wolves had left of poor "Jack," the mule, was rotten, tasteless, and useless to eat. From the kyacks we secured some canvas for our feet.

On the 20th, 21st, 22d, 23d, 24th, and 25th of September we continued our painful march down the valley of the Volkmar, living on cranberries and rose apples. For breakfast we gathered around a rosebush; for lunch we rested near a cranberry patch; dined at 4 p. m. off another rosebush. Camp was made early to enable us to secure enough wood to keep from freezing during the night. Our scant clothing was almost burned off at night in our efforts to keep warm, getting too close to the fire. Without covering, we lay shivering in the snow. The pus-running sores on our feet closed a little at night, only to cause additional pain as we stumbled along the next morning over the hard, frozen ground, which broke them open again. Each morning found us weaker, our clothes more torn and burned, and our sores more painful. We had little to look forward to, if nothing was to be found at the deserted Indian cabin at the mouth of the Volkmar. As my men often said, it would be impossible to make others understand what we suffered these days. No tongue or pen could do the case justice.

On the 25th of September, when within a half mile of the mouth of the Volkmar, we heard the sound of an ax. Since then I often listened for the same sound at night, while looking for a wood-chopper's cabin on the snow-clad banks of the frozen Yukon, but never again do I expect to welcome it so much. The first one to see us was a squaw fixing a birch-bark canoe on the bank of the Volkmar. She aroused the village by her shouts. Five bucks came running toward us, greeting us in the most friendly manner. We were shown to a log house. Bear skins were stretched upon the floor to sit on. The squaws made a great jabbering while they prepared food for us. They needed no words to make them understand what we needed most. One buck spoke a few words of English, which he had learned at Circle City. We ate caribou, moose, and salmon, and drank plenty of tea. Two hours afterwards we ate again, and ate at intervals of two hours during the night, experiencing no discomfort therefrom.

On September 26 we spent the day eating, resting, and trying to obtain information from the Indians. I succeeded in engaging three of them to go down the river in birch-bark canoes to an Indian camp 100 miles below.

On September 27, having secured a few articles of bedding, clothing, and some cooking utensils, we embarked on the muddy, glacial, and swiftly flowing Tanana. We had to keep moving, as the Arctic winter was closing around us. We made about 50 miles, stopping three times to cook and eat. The mouth of Delta River and Delta Creek were passed and a long slough entered, which leaves the main Tanana and winds away to the northwest for over 100 miles before again meeting the Tanana. We camped on a river bar about 9 p. m., all huddling close together with feet to the fire to keep warm while we slept.

On September 28 we made an early start and went 50 miles. Reached an Indian camp at the mouth of the Salchucket, a large river, hitherto a stranger on the map, coming for about 225 miles from a little north of east out of the country between the Tanana and Yukon. Lieutenant Allen failed to see the mouth of this river when he came down the Tanana, as he went down the main river and through Bates Rapids, which the slough avoids. It is up this stream the Volkmar and Salchucket Indians go to Birch Creek and Circle City. The Indians camped at its mouth, engaged in catching salmon, told me that white men and steamboats were up the Chena River, which entered the slough from the northeast 100 miles below the mouth of the Salchucket.

On September 29 we continued on down the Tanana. Our party was increased by four Indians from the Salchucket party. This day a large bull moose swam across the Tanana just ahead of us, and was killed by the Indians when he reached the north bank.

On September 30 we reached the fishing camp of an old chief, at the mouth of the Chena. Leaving Blitch and McGregor with these Indians, who had plenty of meat and fish, I went up the Chena with seven Tanana Indians in canoes to find the steamboats and white men. Having left my men our small supply of bedding, I had to sleep between four of these Indians to keep warm, as the nights were very cold. After three and a half days hard work we reached the forks of the river, 100 miles from the mouth, and found the steamboats and eighteen white men. Along the right bank of this stream a good pack trail could be cut, the ground being level and firm. The white men were much surprised to see one of their race. They tried to persuade me to stay with them all winter,

fearing the rivers would close with ice before I could again meet white men. From them I secured a boat, rifle, ammunition, cooking utensils, clothing, thirty days' provisions, cough medicine for my Indian friends, and salve for our sore feet. Fearing they would get short themselves, they could not afford to sell me much for the Indians, whom I had promised to repay for their kindness when we met the white men. This caused the Indians to get very angry with me, as they could not be made to understand why I did not secure plenty of flour, butter, sugar, etc., for them when they could see it in the white man's possession with their own eyes.

On October 5 the white men gave three cheers as I left, backing my boat down the rapid stream so as to see the rapids and snags. The Indians treated me with sullen silence, paddling leisurely down stream in their canoes.

On October 6, in the evening, we reached the mouth of the river, going 100 miles in a day and a half. We found Blitch and McGregor anxiously awaiting a chance to eat some of the good things my boat contained. As I had overburdened my own stomach by eating too much bread, rice, beans, oatmeal, and dried fruits, I cautioned them; but the temptation was so great they also ate too much and were sick

On October 7, leaving our sullen Indian companions, we wound down the stream, feeling more like real men than we had for many days. Lieutenant Allen's map of the Tanana was found to be marvelously correct. We passed the mouths of tributary streams exactly where we expected to do so. The valley of the Tanana widened toward its mouth. The river was sometimes all in one channel, sometimes in a half dozen. It flowed on the extreme north side of its valley. The valley had widened from 20 miles at the mouth of the Volkmar to more than 40 miles. Abundance of fine timber lined the banks of the main stream and its tributaries. Far to the south could be seen the towering snow-capped peaks and glaciers of the great Alaskan range. To the north the river turned constantly in its attempts to break through the hills and mountains on that side and join the mighty Yukon. Eight Indian villages were passed. They were generally located at the mouth of tributary streams. The largest, of twenty cabins, was opposite the mouth of the Nanana (Lieutenant Allen's "Cantwell") River. The natives desired us to stop; but we rowed from before dawn till after dark each

day, never stopping until we made camp in some convenient bunch of spruce trees.

We expected to reach the Yukon at noon on the 11th of October. About 11.30 a. m. we started to cross the mouth of what seemed a large tributary of the Tanana coming from the northeast out of snow-capped mountains. It floated great masses of ice, and was about one-fourth the width of the Tanana. Expecting to find the Yukon flowing through a broad valley with a width at least as great as the Tanana, this stream puzzled me; but I concluded it was only another case of a large tributary missed by former map makers. We had difficulty in avoiding the large ice floes. When halfway across its mouth I noticed cabins and tents on the north bank, and knew we were at Tanana Station and Weare. A heavy sand storm across the large flats at the mouth of the Tanana had prevented us from seeing these tents and houses as we came down the stream. We had made 250 miles from October 7 to October 11. It was just 12 o'clock when we sat down at the table of Captain Mayo's son to eat in a civilized manner.

Early inquiries had caused us to be resigned to a winter in Alaska, for the last boat had passed Weare on its way down the river about September 10. We were the guests of Mr. Belt, the agent of the N. A. T. & T. Co. at Weare, from October 11 until November 1. During this period we ate plenty, rested, and looked after our feet. If we had been a day late in crossing the Yukon, we would have been compelled to have remained on the south bank until it froze over, as the stream was jammed with ice October 12.

On October 25 it was possible to cross on the ice. On October 30 the sores on my feet stopped running. On November 1 we started for Rampart City, 75 miles up the river. Here I would find Lieutenant Bell and sixty men. This time Blitch and McGregor dragged a sled carrying our bedding and provisions. We passed many cabins occupied by wood-choppers, cutting wood for the steamers for next summer.

On November 5 we reached Rampart City, having camped out two nights and slept two nights in cabins. Rampart is on the south side of the Yukon, at the mouth of Munoock Creek. It has many stores and claims a population of 1,500. At Weare I had written most of my report. At Rampart I

platted my trail roughly on wrapping paper. Turning Blitch and McGregor over to Lieutenant Bell, I began preparations for a trip out to Skagway, over the snow and ice. While not in the best physical condition for a thirteen-hundred-mile tramp in the middle of an Alaskan winter, I decided to come out and report. If I remained until the ice broke up, it would be August before I could reach the States, and the knowledge I had gained would be useless to another party going in this summer. I relied on Lieutenant Bell's excellent judgment in purchasing and equipping seven native dogs and two sleds. Mr. W. J. Cram, experienced in the driving and care of dog teams, was engaged to accompany me.

On the morning of December 9 we said good-bye to Lieutenant Bell and our friends in Rampart and turned our faces up the mighty Yukon, whose frozen waters we were to traverse for thirteen hundred miles before we could reach Skagway and the seaboard.

On December 13 we reached Fort Hamlin, 80 miles up the river, just at noon. Here there are a few white men and Indians on the south side of the Yukon. It marks the end of the flats and the beginning of the ramparts, which extend to Weare.

On December 14 we reached Dahl River, where seventeen large steamers were wintering, all loaded and bound for Dawson. Here we outfitted for Fort Yukon, 220 miles away, taking provisions for fifteen days. There being no trail, we had to break one with snowshoes. The days were not two hours long. The snow was 3 feet deep. The river, a labyrinth of channels, was from 10 to 40 miles wide. The thermometer was 50° to 60° below zero on the 18th, 19th, 20th, 21st, and 22d. On December 18 we passed Lieutenant McManus, Third Artillery, two soldiers, and one Indian guide, from Circle City, going to Rampart to pay off the troops. This was the most difficult part of the journey over the ice. We went for sixteen days without a rest. The sores on my feet broke out again. The feet of the dogs were also very sore. I froze my right cheek and fingers on December 20, but not very badly.

On December 25 we rested in a wood-chopper's cabin, of which there were many all along the river. Several cases of scurvy came under our notice among these people, the result

of no bathing and no fresh meat or vegetables. I had a slight touch of scurvy myself. We passed the mouth of the Chandelar River, unknown to map makers, 25 miles below Fort Yukon. It is 250 miles long and comes from the northwest out of the mountains, south of the Koyukuk River. One of its mouths joins the Porcupine before entering the Yukon.

On December 28 we reached Fort Yukon, in the Arctic Circle. Here we found about one hundred white men, a hundred and fifty Indians, several stores, and two steamers wintering.

December 29, 30, and 31 were spent investigating a case of accidental shooting which occurred 9 miles below Fort Yukon. The miners seemed to think it my duty to capture the supposed murderer, so I reluctantly took the initiative, for time was precious.

On January 2 we left Fort Yukon, reaching Circle City, a hundred miles away, on January 5. We had a good trail all the way. Here we found Captain Richardson, Eighth Infantry, and eighty men. The town claimed 800 population. It contained many stores, being the oldest mining camp on the American Yukon. The diggings are from 65 to 90 miles from town, on tributaries of Birch Creek. I met here Mr. Colombe, the leader of the only white men who have crossed from the head of Birch Creek to the Tanana. It took his party of nine men and eleven horses over forty days to reach the Tanana from Circle City, something we tried to do, with about twelve days' rations, by going up the Volkmar. They experienced great difficulty, encountered many obstacles, and suffered considerable hardship. From the head of the middle fork of Birch Creek they traveled far to the east for many miles, avoiding the rugged peaks at the head of Volkmar River, into which I was unfortunately led by false maps and reports. They struck and followed down the Goodpaster, which enters the Tanana 70 miles below Volkmar. They lost most of their animals before reaching Circle City again. Two winters ago a party of seven Tanana Indians starved to death while attempting to reach Birch Creek from the head of the Salchucket. Last winter a party of five all but perished, being rescued from Circle City after having eaten their snowshoes, moccasins, and dogs. Evidently this would have been our fate had we plunged into the mountains of volcanic rock from

the head of Volkmar River. Weak as we were, without shoes, food, blankets, or a prospect of game, our chances of getting through were very poor. Mr. Colombe believes a good trail can be made up Goodpaster to Birch Creek and Circle City.

On January 8 someone stole a dog and chain from us. Reluctantly we left Captain Richardson on January 10, for he had done everything possible to make our short stay pleasant. The thermometer at the front of his log cabin registered 49° below zero. Twenty miles above Circle City the great Yukon flats end. The river at this point comes out of steep wooded hillsides, from 500 to 2,000 feet high. Having turned in our tent and store to Captain Richardson at Circle City, we had to make a cabin every night or sleep in the snow.

On January 16 we reached Eagle City, having passed settlements at Charlie River, Ivy City, Nation City, and Seventy-Mile. At the latter place there are about 200 miners. Many more are up Charlie and Seventy-Mile rivers, whose sources and lengths are erroneously mapped.

On January 17 we rested at Eagle City. It has the best town site on the American Yukon, and claims a population of 1,000. Most of the mining at present is on American Creek, a tributary of Mission Creek. The latter empties into the Yukon at Eagle City. This is the last town on the American Yukon, the boundary being 11 miles above. Miners have a trail up Mission Creek and its tributaries to Forty-Mile Creek.

On January 19 we reached Fort Cudahy and Forty-Mile, located on opposite sides of Forty-Mile River, on the south bank of the Yukon.

On January 20 we rested at Cudahy. We found here the first Northwestern Mounted Police post, consisting of a sergeant and four men. They are not mounted on the Yukon or its tributaries, save at Tagish Post, the headquarters. They are neither police nor soldiers—a little of both. They have the best equipment as regards clothing that I saw in my journeys. They seem indispensable in the country they police, and are uniformly kind and courteous to all. Their posts are scattered along the Yukon and its tributaries from Fort Cudahy, Yukon territory, to Log Cabin, B. C., which is 15 miles from the summit of White Pass, or 35 miles from Skagway and the seacoast. The posts are not more than 50 miles apart, usually less. They are garrisoned generally by one sergeant and four privates.

On January 22 we reached Dawson City, 330 miles from Circle City. We made this distance in eleven traveling days—thirteen days counting rests. Dawson is located on the north bank of the Yukon, at the mouth of the Klondike River, which comes from east and north of it, out of elevated, timbered hills. The city claims a population of 16,000, and with the people on the creeks 30,000. There are about one hundred regular Canadian troops here. It boasts of electric lights, good hotels, theaters, telephones, stage lines to mining camps in the vicinity, and plenty of fresh beef at 15 cents a pound, at this time. I intended to rest five days in Dawson, as my feet and the dogs' feet were blistered and very sore from pounding the hard, frozen trail. While in Dawson we saw the cinematograph bombardment of Matanzas by the American fleet.

On January 25 we again lost a dog and chain. Our dogs were among the few interior or native dogs on the upper river, and the envy of all travelers. For this reason we were constantly in danger of having all of them stolen. I spent until February 1 hunting for this dog, assisted by the Northwestern Mounted Police of Dawson, but all in vain.

On February 1 we said good-bye to Dawson and started out over the cold trail for Skagway, 600 miles away. We reached Fort Selkirk February 7. It is garrisoned by four hundred regular Canadian troops, under orders to move to Dawson in the spring. It has about 200 population, exclusive of troops, and is located at the head of the Yukon River, at the junction of the Lewis and Pelley rivers.

On February 8 we rested at Fort Selkirk, having come 180 miles from Dawson in seven days. In this journey we passed the mouths of Indian, Sixty-Mile, Stewart, White, and Selwyn rivers.

On February 9 we started once more for the coast, now following the frozen waters of Lewis River, which flowed between steep wooded hills, as did the Yukon from Circle City.

On February 15 we reached Hootalinqua, at the head of the Lewis River, and at the junction of the Hootalinqua and Thirty-Mile rivers. We rested here one day. Seventy-five miles above Fort Selkirk are the Finger Rapids. Four immense rocks break the Lewis River into five channels. Between Fort Selkirk and Hootalinqua are the mouths of Big and Little Salmon and Casier rivers.

On February 17 we left Hootalinqua and followed up the Thirty-Mile River. This stream proved a stumbling-block to many Klondike gold seekers last year. More lives were lost on it than on any other in this region. It is open in many places in winter. Several portages were made to avoid its snake-like windings. At its source the country assumes a divide appearance. Numerous lakes and gently sloping hills told us that soon water would be flowing away from us, and we would be going downhill to the sea. On Lake Le Barge, at the head of Thirty-Mile River, we encountered a severe wind and snow storm. In this same storm eight miners perished on Lake Atlin, a neighboring body of water. As we had the wind with us, we let it blow us across the 36 miles of frozen lake up into Fifty-Mile River. I do not believe any mortal thing could have faced this storm. Eighty-five miles above Hootalinqua we went around the famous White Horse Rapids by a well-established road, striking the river again above Miles Canyon. Here a tramway 4 miles in length permits the gold seeker to transfer his impedimenta around the rapids. Steamers run from the foot of the rapids to Dawson and from Bennett City to the head.

On February 23 we reached Bennett City, at the head of Bennett Lake. From here the trail winds away from the water courses and lakes, climbing the divide to summit; crosses and recrosses the White Pass and Yukon Railway, under process of construction. Seldom does it not storm on these passes. It would have been impossible to have crossed the day we did had the trail not been marked by numerous spruce trees at short intervals. At 4 p. m. we boarded a railroad train on the summit of White Pass, and rode down the 20 miles of wonderful railway to Skagway. This road winds for miles over the ice-bound canyon of Skagway River, along the face of precipitous bluffs more than 1,000 feet above the frozen torrent below. Far down can be seen the sled trail to the summit. Many small, black dots were visible on the white surface, meaning that another army of gold seekers is on its long, perilous journey into the wilderness from which we were emerging. How many, many have gone before them, filled, as they are, with radiant hopes; but so very, very few will ever realize them. The chance of winning the prize is not worth the hardships and toil required to get it. As we went bumping along this odd railroad, the evening of the

24th, I felt for the thousandth time since I turned my face back from the ragged, rocky peaks at the head of the Volkmar, on the 15th of September, that I was going home. This means more to the wanderer than I could ever tell.

On February 25 we reached Skagway at 8 p. m. The next morning I went over to the Government reservation below Dyea and met Capt. R. T. Yeatman, Fourteenth Infantry, who has fifty men of his company with him. He kindly received the dogs, sleds, and other Government property which it would be useless to take to the States with me. Regretfully we parted with our true and tried friends, the dogs. At 5 p. m. we sailed from Skagway on the steamer *City of Seattle*, reaching Seattle, Wash., and Vancouver Barracks on March 1.

TRANSPORTATION.

In a country so little known and offering so many natural obstacles and hindrances to travel, the transportation of the necessary impedimenta of camp life has been a difficult problem to solve. The exploration of the coast line with small steamers was an easy matter. As soon as we started across country, locating and cutting out our own trail, many difficulties to transportation were encountered.

If a sufficient number of pack animals were available, and enough men at hand to level all brush, build all bridges, corduroy all swamps, and escarp all inclines, travel would be rapid in Alaska.

My experience leads me to the conclusion that, all things considered, a hardy, well-built, big-footed horse is about as good an animal for summer use as can be secured. No doubt the mule is more hardy, but his small feet makes the abundance of marsh land a great drawback to his use. Each animal can carry about 200 pounds.

The interior Indians pack small amounts, 10 to 40 pounds, on their dogs, using two canvas pouches, thrown over the dog's back and secured around the base of his neck and around the stomach by straps of canvas. This contrivance could possibly be used on some of our larger dogs.

Whether mules or horses are used, protection to the ears should be carried to help them against the ravages of the mosquitoes and, worst of all, the white-legged fly. The latter on one occasion caused me to go into camp at once and make covering for the animals' ears.

On a hard, well-beaten winter trail the horse can be used under certain conditions to great advantage. Hundreds of horses were worked on the trail from Dawson City to Skagway, 600 miles, during the past winter. The principal objection to the horse in winter is the same which applies to the dog in summer, viz, the carrying of food. If stations were established with plenty of forage, the horse could be used advantageously in winter, as his food means much bulk and weight on a sled. For winter travel the interior, or native, dogs are the best. Unfortunately, their supply seems limited. The Herschel Island dog, from the Arctic Ocean, is perhaps the best, counting on his great size, great strength, and his wonderful affection for man. There is something noble, yet pathetic, about their lives. Gladly each morning they stand with wagging tails while the cold, frozen harness is clasped about their necks and sides of fur. All day long and well into the night they work, work, work, pulling the heavily loaded sleighs, now over good, smooth ice, now up and down over hummocks. Hard blows and harder words are usually their portion, and at night a frozen fish and a bed of snow and ice, with the thermometer perhaps 60° below zero. Always faithful, always ready to pull for all there is in them, kind and affectionate to man, it would seem they deserved a better fate.

The Husky dog, of the Upper Yukon and Tanana, is the next best dog. He is smaller than the Herschel Island dog and not so willing to work. After him comes the Malemute, from the Lower Yukon, with his fox-like head, ears, and face. He is the smallest dog of all, but is larger than our setters. They are the least affectionate and useful to man. Still they are better, all things considered, than our outside dogs. On a fair trail an average dog can pull 150 pounds on a sled. We had one Herschel Island dog that could pull 500 pounds on a good trail.

The sleds used are basket, built to a height of 18 inches to 2 feet, or the flat Yukon sled. Through heavy snow, without a trail, the toboggan is the best. The basket sled carries more stuff and more securely than the flat Yukon sled, but is more easily overturned on inclined ice. Steel runners are a tremendous drawback in very cold weather and deep snow. The runner sticks to the snow as one's tongue would to cold steel. The wooden runner is the best for all purposes. The usual

harness of the dogs consists of a leather collar with traces attached, which are secured by a surcingle about the dog's middle, and clasped by snaps to rings in the harness of the next dog in the rear or to the sled itself. As food the interior dogs prefer dried fish, but will eat bacon alone or cooked with rice, flour, oatmeal, or corn meal. Fish is the best food, and weighs least.

Some form of folding canoe or canvas boat would be a great help in crossing large streams. The Indians use the birch-bark canoes in navigating them. I rode 400 miles in one, but did not feel very secure of my position. It seemed like taking a voyage in a peanut shell. The Indians are very expert in handling them. The Peterborough canoe was used successfully by several geological parties in Alaskan rivers last summer.

My experience with rafts will not permit me to recommend them. Without tools or rope, our efforts were bound to give poor results. Every party should be supplied with a 1½-inch bit. A wooden handle can be made easily. The great rapidity of current, the numerous sweepers, rapids, and timber jams of Alaskan streams makes rafting very dangerous. If one must be used, it should be as substantial as possible. A good form, for three men with impedimenta, can be made out of five logs 20 to 24 feet long and 8 inches to 1 foot in diameter. At least three strong cross braces should bind them securely. A sweep, in wooden lock, at each end will best propel and steer them.

The least desirable form of transportation for man is the earliest, loading his worldly goods on his own back. Many varieties of packs are used by the soldiers of different nations. The Merriam pack, invented by Brig. Gen. H. C. Merriam, U. S. A., is as good as I ever carried. It combines lightness, stability, simplicity, and adaptability. Much can be carried in a secure form. The greatest misfortune to the pack carrier is to have an apparatus which will permit him to lose anything. A man never carries very far on his back what he does not absolutely need, and to lose one of these articles, which it is impossible to replace, is often a serious misfortune. One must try the various ways of carrying a blanket-roll pack before he can determine which suits him best. A sled is best and easiest dragged with a broad strap over the chest and under the arms. One hand helps to hold it in place, the other should hold the indispensable gee pole.

The reindeer is condemned by all who have tried to use him on the Yukon.

GAME.

Alaska is not so plentifully supplied with game as most people imagine. It is a country of great extent. Many large tracts seem devoid of game entirely, and are as perfect solitude as one could imagine. Each summer thousands of waterfowl and song birds pay a visit to this northern country, rear their young, and then all go south again. Among them I noticed many varieties of ducks—canvasback, redhead, mallard; green-winged, blue-winged, and cinnamon teal; butterballs, gadwell, widgeon, ruddy, golden-eye, and many others.

The coot family has innumerable representatives. The heron family is present. Canada, gray, Hudson Bay, snow, and other varieties of geese, also swan, are here. The snipe family comes early—big and little yellowlegs, marlin, curlew, willet, jack, robin, and ox-eye snipe; golden, black-breasted plover, and even Bartram's tattler, the upland field plover. Gulls, loons, and mergansers are plentiful. Many of these waterfowl stay all winter along the mild south coast of Alaska. I saw young mallards on the 6th of June, near Knik Arm, and half-grown jacksnipe in the passes of the Alaskan range on August 16. Song birds are plentiful. The robin redbreast, painted robin, catbird, and brown thrush sing all the long summer days. Besides these, redheaded, golden and red-shafted woodpeckers, kingbirds, hawks, and larks come and go, with many others. Over all sweeps the mighty bald eagle, who, year after year, comes back to these vast wastes to rear his young and scream defiance to beast and bird. All these birds are migratory. The ice-and-snow-bound Alaska never sees them. Her winter inhabitants are few. Most often seen is that cunning scavenger, the raven. Winter and summer he is present. Let blood flow, and he seems to drop out of the clouds to claim his share. The ptarmigan, or white grouse, in winter, brown in summer, is a constant resident of Alaska. He moves about in winter, unlike several other varieties of Alaskan grouse. The latter seek the center of some dense spruce tree and eat the branches all winter. There are a few small snowbirds that winter in the interior, and, besides those mentioned, are the only birds that remain after the snow comes.

Of the small four-legged creatures I noticed little red squirrels, porcupines, small big-footed rabbits, muskrats, beaver, marten, mice, badgers, whistling jacks, ground squirrels, and others which I can not name. The whistling jack resembles the ground hog, and derives his name from the sharp, warning whistle he gives to his fellows when he disappears in a hole in the rocks at the approach of danger. They are good eating. The small rabbit seems almost extinct south of the Alaskan range. Their great, broad feet permit them to run easily over the fine, powdery snow of the interior.

The large game consists of bear, moose, caribou, sheep, goats, lynx, foxes, wolves, and wolverines. Deer are reported plentiful on the extreme south coast and islands. The Indians rely principally on the moose for food, which is found in almost every part of Alaska. I saw the tracks of perhaps a thousand moose, yet they are so shy, so quick to discern your presence, I never saw but one live one. They are more easily secured in the mating season, October, and when the snow is deep in the late winter and early spring, February and March. Their principal food in winter is the willow bark, and in summer this bark with the leaves of small herbs. They keep in the marshes and river bottoms in summer, and in winter in the protected and secluded gulches.

Next to the moose the caribou, smaller in size, is most sought for its flesh and skin. It roams wherever the arctic moss, its principal food, grows. It is more of a traveler than the moose, moving southward in great bands in the fall. It is most easily seen frequenting the hilltops above timber line, where the moss is plentiful. Most white people prefer its meat to that of the moose.

The bighorn sheep inhabit certain mountain ranges. They are plentiful along the Matanuska River and in the main Alaskan range. It is at least half as large again as our domestic animal, and is good eating. The Indians use its flesh for food, its sinews for thread, its horns for spoons, and its skin for a bed. While it is wild and shy, it does not fear being seen, feeling secure, far up in the crags, from its natural enemies, the bears and wolves, not counting on man and his rifle. Goats are not plentiful anywhere, but a few have been killed in the great mountains south of the Matanuska River.

The principal bears are the large brown bear and the small black one. I saw the tracks of hundreds, but never saw a

live one. The brown bear, judging from its skin, is an immense animal. It is very shy. According to report it is most ferocious when wounded. The small black bear is most plentiful, but not so fierce.

There are two wolves, the black and the gray. None of the former were seen by me, although abundance of tracks were visible. I saw four of the latter, and had the pleasure of eating part of one. They are very large animals, frequently measuring 7 feet from end of nose to root of tail.

The wolverine, judging from his antics, enjoys a joke. Many caches are torn open by them and their contents destroyed, although not edible. He is reported to be fearless. But we were never fortunate enough to see one. Lynx are plentiful in the river bottoms, but since their principal food, the rabbits, have disappeared south of the Alaskan range, they too have moved north.

Bear, wolves, foxes, wolverines, and lynx are scattered all over the country. To the far north, near the Arctic Ocean, musk ox are supposed to exist.

TRAILS.

The trails of Alaska are inferior at best. The country has been crossed so seldom in any direction by white men, save in a few portions near the Pacific coast, that the establishment of a clear-cut, well-defined trail has not been possible. In that portion of Alaska traversed by myself I found no continuous trail going from any one point to another, even between places less than 20 miles from each other. I do not include in this the winter trails over snow and ice; they are not permanent and do not exist at all in summer. There are so few Indians, and they travel so little, that practically no trails worthy of the name are made by them. Consequently, in the narrative of events from day to day, when trail is mentioned, it is meant one located, established, and cut out by ourselves alone. If a game trail is followed, it is mentioned. The latter are by far the most numerous throughout the country. The large game, in moving from one locality to another, has succeeded in wearing narrow paths in all directions. At some points these trails are very distinct, at others lost entirely. Where they are distinct the topography of the country is responsible, having made all the animals walk over the same ground, as between canyon walls, on narrow necks

of solid ground between lakes and marshes, along the banks of larger streams which prevented fording at all points and compelled both man and beast to go up or down along their banks to find a crossing place. The game trails consequently start from nowhere in particular and go to nowhere in particular. Frequently they were found for short distances where we wanted to go, and were broadened and followed by us.

We cut out and established a trail from Knik Arm across the Tanana River to the head of the Volkmar River, which extended about 460 miles. The portion of the trail beyond the Tanana River is not practicable, in my estimation. After crossing the stream we had a succession of steep gulches to cross for nearly 10 miles, then we struck the Volkmar. About 25 miles from its mouth this stream sweeps from side to side of a narrow valley, cutting out bluffs, and compelled us to climb hillsides repeatedly. The hillsides were almost as nearly perpendicular as the bluffs themselves. No trail could be made to its source without immense labor. From its source one would require wings to successfully cross the very steep, high, and rugged masses of volcanic rock which extend for at least 30 miles in all directions. From reports, the Goodpaster River, which empties into the Tanana from a little north of east about 70 miles above the Volkmar, affords a way to Birch Creek and Circle City. Our trail down the Delta River could be turned off northeast about 25 miles from the junction of the Delta and Tanana, and, cutting across the wide valley of the Tanana, strike the river opposite the mouth of Goodpaster. From my own observations and the reports of miners, this is a very possible way to Circle City. The Volkmar Indians go west 100 miles to the Salchucket, and up it to Birch Creek, on their way to Circle City. The Chena Indians go up this stream to Circle City.

I met miners at Weare who came over the Valdez Glacier to the Taxlena River, a tributary of the Copper River. They followed up the Taxlena to Lake Plaveznie, and thence to Upper Lake Plaveznie; thence to Lake Louise, and down its outlet stream due north for 60 miles to the left-hand fork of the Sushitna; across it to a low pass and down the Nanana (Lieutenant Allen's "Cantwell" River) for 200 miles to the Tanana. They came near starving to death, being rescued by the Tanana Indians at the village across from the mouth of

the Nanana, which point is 165 miles from Weare and the Yukon.

I met miners at Weare and elsewhere on the Yukon who came up Copper River and down Forty-Mile to the Yukon. One man came this way into Dawson City with a horse. Indians go from Rampart City, at the mouth of Munoock Creek, on the Yukon River, up Munoock Creek and over the divide to Baker Creek, and down it to the Tanana.

Good sketches of Munoock Creek, Hess River, Salchucket and Chena rivers have been obtained.

Miners go from Weare across several series of ridges to the Tozikakat. A sketch of the route up Dahl River to the Koyukuk has been obtained. A geological party has accurately mapped Birch Creek and its tributaries. Another geological party, under Mr. Bernard, this year mapped a tract of country a degree of latitude by a degree of longitude, in which Eagle City is located. An old resident of Alaska, Mr. Chapman, has a good map of the Koyukuk country, which he would not permit me to see, but which, he said, had been sent to the War Department, in Washington. The oldest miners in that region claim it is the best map of the Upper Koyukuk existing.

Most of the travel by trail in Alaska is done in winter over the snow and ice. One can carry loads on a sled much easier than on one's back. The dogs of this country can be used best at this season of the year. Travel is confined mainly to the beds of streams or over the glaciers of the coast country; trails elsewhere made are kept open with great difficulty on account of the drifting snow. We found a good trail up the frozen Yukon and its tributaries, from Fort Yukon to Skagway, a distance of 1,000 miles. From Rampart City to Fort Yukon, a distance of 300 miles, we were compelled to break a trail through the snow, which was from 18 inches to 3 feet deep. A trail across country in winter will be a most difficult thing to keep open.

Without having experience, it would be difficult to make one understand the hard work, danger, and difficulties one must encounter in crossing any pass or glacier in winter.

The Chilkoot Pass, above Dyea, and the White Pass, above Skagway, have records which speak for themselves. Hundreds have lost their lives on them. An absolutely clear day on one of these passes in winter is indeed a rare occasion. If it does not snow, the strong, icy-cold wind blows the plenty

that is already upon the ground about so much that it is with difficulty that one can see 25 yards in any direction.

These trails are traveled continuously by hundreds of people, dogs, and horses each day, yet it is hard to follow the trail if you are 50 yards behind even a dozen big teams of horses and sleighs. It would be impossible to follow the trails were it not for the fir trees planted in the snow about every 5 yards.

Storms have come up in five minutes on these passes out of a clear sky, compelling travelers to unhitch dogs or horses and seek safety in a rapid descent. Some storms have lasted three weeks. The sleighs and their contents abandoned in February perhaps would not be found until the next July. Such experiences are not uncommon. From them we may judge of the work necessary to keep any winter trail open which goes over a pass. I might add that every trail of any length will go over a pass, for Alaska is nothing if not mountainous.

The White Pass and Yukon Railroad, running at present from the summit of White Pass to Skagway, employs over a thousand men daily to shovel snow from its tracks in winter. The higher the pass the worse the trail is. The White Pass is the lowest known, and is 2,880 feet above sea level.

All winter travel in Alaska is dangerous. On the frozen rivers one is constantly in danger of falling through thin ice which the snow conceals. If the feet get wet, a change of stockings and foot-wear must be made at once, or frozen feet will be the result. On glaciers one can easily fall into a crevasse, as hundreds have done, and never be seen again. On all glaciers the possibility of getting lost in storms is very great. The bodies of many unfortunates so perishing will never be found. Wherever a winter trail is made it should be so well marked that one can not lose it. Log cabins, with stoves, bunks, and wood, should be built not more than 20 miles apart over the entire route.

The following is a list of houses, boats, and towns that existed along the Yukon last winter from Circle City to Skagway, a distance of about 900 miles. By their aid we were able to leave our tent and stove at Circle City:

	Miles.
Twenty-Mile House	20
Webbers	22
Coal Creek	22

	Miles.
Jim the Indian	25
Ivy City	25
Nation City	28
Star (Seventy-Mile)	29
Eagle City, Alaska	21
Steamer Arnold, Yukon Transfer	24
Forty-Mile	22
Station No. 2	18
Station No. 1	20
Dawson City	18
Ainsley	21
Indian River	11
Reindeer	9
Cabin	4
Sixty-Mile	9
Nine-Mile	9
Stewart City	16
Kerry Mill	9
White River	8
Thistle Creek	13
Steamboats	10
Tulare Creek	10
Arctic Express Co	7
Bertha Creek	7
Big Four	10
Northwest Express	8
Selwyne River	5
Holbrook	12
Halfway House	7
Fort Selkirk	18
Carsens	17
Arctic Express	13
Big Horn	12
Goarnig's House	4
Five-Finger Rapids	17
Northwest Express	22
Arctic Express	5
Little Salmon	35
Bank House	16
Big Salmon	25
Cassiar River	8
Wood-choppers	1
Hootalinqua	33
Cabin (Halfway House)	17
Northwest Express	17
Cabin	34
Miles Canyon	28
Marsh Lake	25
Tagish House	25
Caribou Crossing	22

	Miles.
Bennett City	34
Log Cabin, B. C.	12
Summit, Alaska	15
Skagway	20

MOUNTAINS.

Alaska has more than its share of mountains. Many distinct ranges and many more conglomerate heaps diversify and break its surface in all directions. Topographically considered, it is a freak. Between two large streams thousands of miles in extent, and draining hundreds of thousands of square miles, frequently no distinct divide is determinable. The tributaries of the Tanana and Yukon, having source in that great mountainous tract extending from their junction eastward to a line from the head of Copper River to the head of Forty-Mile, do not rise on opposite sides of a divide and flow to the Tanana or to the Yukon. The heads of the Chena, Salchucket, Volkmar, and Goodpaster dovetail into the heads of Birch Creek, Charlie River, Mission Creek, and Forty-Mile River.

One of the few parties of white men who ever succeeded in getting across from the head of Birch Creek to the Tanana did so by mistake. They were short of rations, and being on the head waters of Birch Creek wished to cross to the head of Charlie River and go down it to the Yukon. They turned east over a divide to where the head waters of the Charlie River were supposed to be, and found a stream flowing northeast toward the Yukon, which they concluded was Charlie River. They followed it in this direction until it was large enough to float a raft, when they built one and continued on northeast. Soon the river turned east, then southeast, south, southwest, west, and then northwest. They were compelled to follow it, and it led them to the Tanana, and thence to Weare. It was the Salchucket which they had followed.

Last summer a party of miners floated down the Yukon from Dawson to the mouth of Ray River. It took them two and a half months to get their supplies up to the head waters of Ray River. They were bound north for the Koyukuk. Supplies for two years, canoes, etc., were dragged up by hand to the source of Ray River. Over a divide they found a stream going north, which they supposed would lead them to the Koyukuk. Rafts were built and loaded, canoes were loaded, and they started down the supposed tributary of the

Koyukuk. Not paying much heed to direction, they followed this stream until it joined a mighty river. In a few hours the captain of a passing steamboat told them they were on the Yukon River. They had gone up the Ray River and down the Dahl River, coming out on the Yukon about 10 miles above where they left it three months before. A summer's work for nothing. Such experiences prove the concentric formation of the mountain ridges in some parts of Alaska.

In other portions, as in the country between Prince William Sound on the south and the Matanuska on the north, we have a great conglomerate mass of glaciers and high mountains. Out of this immense tract small streams flow north, east, south, and west.

The coast of Alaska is fringed from the boundary between it and British Columbia northward to Cooks Inlet by a mountain chain known as the Coast range. It varies from 2,000 feet to 8,000 feet in height. From Port Valdez to the head of Portage Bay, in Prince William Sound, the sea washes the base of the mountains of this chain. The same is the case over the glacier and down both shores of Turnagain Arm. The tract of country north of the latter and Prince William Sound and south of the Matanuska is a mass of very high peaks and glaciers. Extending northward from an east and west line drawn from the mouth of the Matanuska to the Sushitna, and lying between these rivers, is a mountain chain of considerable height, from 3,000 feet to 7,000 feet in elevation. It has many high peaks and glaciers running to the north for about 200 miles and ending 60 miles south of the great Alaskan range. The latter is full of glaciers, and trends west from the head of Copper River to the head of the Sushitna, and then southwest. It has a width of from 40 to 70 miles, and is almost 20 miles south of the Tanana River at the mouth of the Volkmar, and 50 miles south of the Tanana at its mouth. Between the Tanana and Yukon a great mass of mountains and mountain ridges trend generally east and west, with an elevation of 2,000 to 5,000 feet. No glaciers exist in them. The Tanana flows at their base in many places. On the north side the Yukon flows northwest from Circle City, away from these mountains, till it reaches Fort Yukon. It then turns southwest and cuts through them at the Ramparts. Between the Yukon and Tozikakat are ridges from 2,000 to

4,000 feet in elevation, with no glaciers. Paralleling the course of the Yukon from Fort Yukon to Dahl River, and north of it about 25 miles, are the Romanoff Mountains, without glaciers. North of the Yukon from Circle City upstream to the Alaskan boundary the river runs at the base of the mountains, from 1,000 to 3,000 feet in elevation

TREES, SHRUBS, GRASSES, FLOWERS.

Contrary to general opinion, Alaska is not one field of perpetual snow and ice. While the almost constant rays of a summer sun attack in vain the snow peaks and glaciers of the higher mountain ranges, there are many stretches of swamp land, river bottom, wooded hillsides, and elevated, rolling, mossy tracts, from which the snow and ice are entirely absent for from three to six months of every year. Here we frequently find abundance of timber and vegetation. Naturally the evergreen trees—spruce, fir, and pine timber—cover most of the wooded stretches of Alaska. Next to these the cottonwood and poplar are the most plentiful, near the Pacific coast, in the valley of the Matanuska, and over the rolling ridges north of it to the base of the Alaskan range. In the valleys of the Tanana and Yukon the birch tree is most plentiful after the evergreen. It is used by the natives in constructing canoes, baskets, and shelter. In all the river bottoms small willows are found, the principal summer and winter food of the moose. In addition, there are dogwood, alder, juniper, and hemlock.

An elevation of 1,000 feet or more above sea level in Alaska means a scrubby growth of timber, or none at all. In addition to the scrubby timber, we have real shrubs in the currant, blueberry, cranberry, and grouseberry bushes. The small tag alder is the most difficult of all brush to get through. There is also a small black berry growing on what appears to be a miniature pine tree.

Many beautiful varieties of flowers are found in Alaska. River bottoms and hillsides have great patches of bright color all over them by the middle of June. Wild roses are very numerous. The seed which remains on the bush after the flowers have bloomed proved very good eating for us at one time. The waters of ponds are covered with white and yellow water lilies. Far up among the snow peaks and crags, just below the perpetual snow line, the most delicate and beautiful

flowers are found. Lack of means to carry and preserve them prevented me from getting a fair collection. A few accompany this report.

Grass is present almost everywhere. While most plentiful in river bottoms, marshes, and near lakes, it can be found in abundance over high, elevated ridges above timber line. There are many varieties, some as high as a man's head. This high grass is not nutritious, however, having such a rapid growth that it lacks substance. The short bunch grass was preferred by our animals. In the absence of grass, the animals took readily to the small willows.

INDIANS.

The real Indian, as our mind pictures him, is extinct in Alaska. Of the thousands of savages who formerly called these wastes home, clad in the skins of animals, armed with the bow, arrow, and spear, eating and cooking in vessels of stone and birch bark, none exist. In their places we have a few hundreds of widely-scattered people, wearing white men's clothing, using his cooking utensils and household furniture, following his customs and habits, and ambitious to be "all same white man."

The last fifteen years have witnessed a great reduction in the number of Alaskan Indians, and a great change in those who survive. Of the hundreds Lieutenants Allen and Schwatka report along the Tanana and Yukon, I saw a few small families only. Certainly the presence of white men has had some effect on the physical welfare of the Alaskan Indian. There have been a great number of deaths within the last few years among the Yukon and Tanana Indians.

The Coast Indians of Prince William Sound and Cooks Inlet are poor specimens of humanity at best. Their principal food is fish (salmon and halibut). So much have they associated and intermarried with the whites that it is difficult to determine what their original customs and habits were like. At present they occupy so many varied positions under different conditions that a great difference exists, even between members of the same family. Some of the men are pilots on coast vessels, intelligent and respectable. Some of the women are the wives of intelligent white men, and are elevated correspondingly.

At Haines Mission a young Indian girl, Miss Willard, has charge of the Indian school, having been educated in our Eastern States. From this, the highest grade of intelligence and respectability, we have all kinds down to the lowest form of Coast Indians. These poor creatures resemble the ravens and gulls about them, getting an existence out of what others throw away. There are few normal individuals among them; deformities are frequent. They obtain a livelihood by catching fish, which they eat or sell, by helping to load and unload vessels, and by odd jobs the whites can find no one else willing to do. The Tyoonoks of Cooks Inlet earn a few dollars occasionally by gathering the coal which is washed up on the beach by each succeeding tide.

While they understand more of the white people and their ways, from association, than many of the interior Indians, they are not the equal of the latter in physical or mental power. Their chiefs, or tyones, exert small influence.

The affairs of each small hamlet are influenced greatly by the power of missionaries. The latter have brought about a change in customs and habits, an approximation to the white man's way of living. These Indians seem a lazy, spiritless lot in their lowest forms, which are nearest the original Indian, managing, in some manner, to get a miserable existence out of the conditions that at present surround them.

We saw no Indians after leaving the coast until we had reached the lake region, which is drained by the western tributaries of the Copper River. Here we met the Matanuskas, fishing for salmon in Upper Lake Plaveznie, whose outlet stream, the Taxlena, is a tributary of the Copper River. These Indians are perhaps the wildest, bravest, and least known of the Alaskan Indians. They are least influenced by the whites, doing most of their trading second-hand, with the Tananas to the north or Copper Rivers to the east. Occasionally they come out to Knik Station, at the head of Cooks Inlet. They are very large physically. It is a mystery where they get their height, as all the tribes about them resemble the Japanese in stature. The chief of the Matanuskas, Andre, is 6 feet 2 inches and weighs 220 pounds. I saw several men who must be 6 feet 4 inches in height.

There are about seventy people in the tribe—men, women, and children. I saw no deformities of any kind. Their principal food is moose, caribou, sheep, deer, beaver, lynx,

rabbit, squirrel, porcupine, whistling jack, and the goat; also a few of the larger birds, like the grouse, duck, geese, and swan; and fish, mostly salmon, with some trout and grayling. In addition to this they get what they can afford from the trading stations. The country about them produces the berries known to Alaska, as cranberries, blueberries, pineberries, grouseberries, and currants. They eat a species of wild celery and several roots, one called celere, white and resembling the carrot in shape and the turnip in taste. As in most Indian tribes, the men eat first, the women next, and the children get what is left.

When we met them, on August 5, they were engaged in catching humpbacked salmon in the outlet stream of Upper Lake Plaveznie. This they did by standing in the water with spear poised. The latter was of wood, with steel, iron, or bone point. It had a strong deer thong secured to the upper end of it, the thong tied to the spear about a foot from the end. When the barbed point was thrown into the fish it came off the spear, and the line attached to it and the spear gave considerable chance to play the fish and land him without breaking the spear. This was a novel but very good improvement over all the fish spears I have ever seen.

They expected to go to the mountains after caribou and sheep in a few days, having caught and dried all the fish they desired. Like all Indians, their capacity for food seems unlimited. The eating of one variety requires a great quantity, as we afterwards learned.

These people roam in the country bounded on the west by the Sushitna Valley, on the north by the Tanana, on the east by the Copper River, and on the south by the mountains north of Prince William Sound. The Coast Indians, Kniks, and Tyoonoks fear them very much. The Copper River Indians also give them plenty of latitude. To the north the Tananas are not so much in dread of them, their intercourse being slight on account of distance and natural obstacles, such as the Alaskan range.

In summer they live in small tents and shelters; in winter in log cabins. Stoves, tables, beds, chairs, cooking utensils, clocks, mirrors, prints from illustrated papers, furnish and decorate the interior of their winter homes. The summer shelters are made of bark, moose and caribou skins, and drilling. All have good rifles and generally plenty of ammunition.

They eat the entrails of animals and birds, the latter without cleaning. They still use the sweat bath, getting into an inclosure of bark and brush where vapor from heated stones causes an almost suffocating heat, out of which they dash nude into an ice-cold stream. They have little or no faith in their medicine man, and are ready to take anything a white man says is medicine.

The men and women still wear earnips, but nothing is worn in the nose. Both paint the face and bodies, and wear bracelets and finger rings. The hair of the women and medicine men is long; the others usually let it grow in winter and cut it in summer. Their features are uniformly good. Some of the women are as beautiful as any Indian women I ever saw.

The men have a proud, fierce look, and seem to realize that they are more powerful physically than most men they meet. White men they regard with suspicion, and are very jealous of their squaws. The latter court the attentions of the whites, as their lot is a hard one with their brown masters. All the drudgery of camp life and packing loads from place to place falls to them. These Indians resent the presence of white people in their country, and were sullen and inhospitable while I was with them. The chief, Andre, told my Knik interpreter to tell me that I had no right in his country, as it belonged to him. He was informed that I would go where I pleased, whether he liked it or not. Any sign of fear of them might lead to serious trouble.

They all have dogs which resemble the Malanute dog of the Lower Yukon, but they are much smaller. In summer they pack them with from 20 to 40 pounds; in winter use them with their sleds.

When feeling good after a hearty meal the young bucks sometimes engage in friendly wrestling bouts. These, with occasional attempts at singing, are the only forms of native amusement known to the Matanuskas.

The young are carried on the backs of their mothers, either in a birch-bark basket or by placing the arms about the mother's neck and legs about her body, being supported in this position by a shawl or blanket.

We found many of these Indians using netting to protect them from the mosquitoes. I noticed one old medicine man, without covering, catching the mosquitoes and eating them. This they all do with the vermin they catch on each other's heads and bodies.

The girls are made to live alone in darkness on little food at the first sign of maturity. At childbirth a mother must live three days without anything to eat and take care of her child at the same time. Such barbarous customs account for the very few women and children in this tribe in proportion to the men.

Although women are very scarce, polygamy is not unknown. The children are given a pack to bear as soon as they can walk. It is surprising, but pitiful, to see what packs are placed on their poor little shoulders. The men frequently indulge in orations, like the Tananas and Yukon Indians. But one of these Matanuskas could be induced to pack for me. He was a young buck about 20 years old, and agreed to pack five days for a bright-colored blanket. I was to give him tea and coffee while packing. He carried some dried fish as food. I let him eat what we did, however, as it was contrary to a white man's way to sit down and eat plenty while a fellow-being at his side went hungry. Later I punished him, with others, by not giving them anything, because they lied to me constantly.

The chief is known as the "tyone," and next in importance is his family. After them come the medicine men. The remainder of the tribe owe allegiance to the chief, but he does not seem to have much power. Marriages have to be made with his consent. He comes in for a share of the game and fish everybody catches.

A woman who outlives her husband is unfortunate, as his possessions are divided up among the whole tribe at what is called a "potlatch." She is poverty-stricken, and if she does not marry becomes a slave of her relatives. The oldest boy becomes the head of the family. His brothers and sisters are his slaves until they are old enough to marry.

After leaving the Matanuskas, we went for 80 miles without seeing a human being. At the forks of the Gakona River and entrance to the pass through the Alaskan range we met a Copper River Indian and his little boy. He had come up the Copper River, which, he said, was four sleeps away, and was on a journey to the Tanana slopes of the Alaskan range to hunt caribou. I engaged him to pack for us. He knew the Matanuska and feared him, but looked with contempt on the Knik. The latter was also an object of supreme contempt

to the Matanuska, and would have been compelled to turn slave were it not for our presence.

This Upper Copper River Indian made an addition to feed, so I decided not to give him any food save tea and coffee, as it was impossible for us to tell when we would ever secure a fresh supply. He and his boy ate the entrails of all ducks, whistling jacks, or anything else we threw away. He put as much of a load on his child as the little fellow could stand up under, which caused the latter to have great difficulty in catching up with us. On one occasion I happened to be present when the little fellow came stumbling up to us, panting and sobbing as if his heart would break. He was afraid he would get lost if he had to stay so far behind. I put his pack on one of the mules, although I wanted to save them as much as possible. What was my surprise and anger next morning to find that his father had lightened his own load by giving him a larger load than ever before to carry. Of course I made the father pack all his own load, and left the little boy free to run along without any. This gave him an opportunity to lead one of the mules and made him feel very large.

When almost through the pass of the Alaskan range the Matanuska came running to me one morning during a heavy rainstorm and pointed off to a mountain about 2 miles away calling out "caribou" excitedly. I could not see any caribou, but saw something which looked like a man. With my glasses I made out clearly an Indian who had seen us and was following parallel to our course, running from rock to rock along the side of the mountains. We halted, and in about half an hour he grew weary of peeking at us from behind a rock and came running toward us. The nearer he got the more nervous the Knik and Upper Copper River Indian got. The Matanuska gazed carelessly at his approach. The first two feared he was a Tanana. Being on his hunting grounds, something one Indian seldom dare do to another, they feared he would kill them. He was received by the Indians as they always receive a new arrival. No one spoke. He stood leaning on his rifle gazing at our animals, the first he had ever seen. The Knik and Upper Copper River Indians feared to look him in the face; but the Matanuska stared him out of countenance, with a fierce, contemptuous glare in his coal-black eyes. After the usual looking had been finished, I told the Knik to ask him who he was, where he came from, etc. This he did, trembling

all the time like a leaf. I saw that he was telling me whatever the Indian compelled him to, regardless of my questions or of the truth. This Indian was from the head of the Tanana, and was hunting caribou in the mountains. He had come many miles, living on dried fish alone.

We found small families of Indians on the Tanana, where Lieutenant Allen saw hundreds. They proved to be the most prosperous Indians we had met. Their life is similar to that of the Matanuska. They trade directly with the whites and get better things. They are not the equal of the Matanuskas physically, not a few deformed people appearing among them. On 750 miles of the Tanana proper and its tributaries I saw seven small hamlets, and not to exceed one hundred Indians—men, women, and children. Those at Volkmar and Salchucket rivers go to Circle City to trade, those on the Chena to Circle City or Rampart City, those at the mouth of the Nanana to Rampart City, and those below the mouth of the Nanana to Weare. They have dogs, sleds, and birch-bark canoes. Their friendship for white people is great, and we owe our lives to their kindness. They would take no money for all the meat, fish, and tea they gave us.

In passing, it is but justice to say a word for these friends of mine, who found us all but dead in the wilderness, with the Alaskan winter closing in around us. Entire strangers and of another race, they received us as no friend of mine, white or colored, ever did before or since. They asked no questions and required no credentials. They were men. It was enough that their fellow-beings were starving. Unknown to them were the wrongs our race have done theirs for centuries. We were the first whites to visit their home. Their hospitality was the greatest I ever saw. It was the same at the village at the mouth of the Salchucket and again at the mouth of the Chena. At each place we were royally entertained. From somewhere half a handful of rice would be brought out and cooked for us, giving each a mouthful. This had been kept stored up for months for some special occasion when someone was sick. It had been part of some stores they went 300 miles to get, in the dead of winter, and carried on their backs 300 miles in returning to their simple homes. Gladly they gave it all to us and asked nothing in return. Beaver tail is a delicacy with them, but they cooked all there was for us at each camp.

For saving her from burning, her dress having caught fire, a squaw gave me a handsome pair of moose-skin mittens. To my men were given beaded knife scabbards, or some little trinket, which to them meant a great deal. Simple, honest, trusting, courageous, these Tanana Indians could have had anything that belonged to me. Unfortunately, I was destitute, and so were my men. When I did find white men, they would sell me little for the Indians, fearing they would run short themselves. Our poverty was a source of good-natured amusement to these Indians. All we had to eat from, or with, were three little spoons. I carried mine in my hip pocket. The Indians always helped us first at meals. For plates we had a piece of birch bark; they ate from tin ones. When the moose or caribou was fried, they would hand me the frying pan, and watch with laughing faces while I pulled my little spoon out of my hip pocket, my trousers in shreds, and take out my portion of the moose meat on my piece of birch bark. At each camp they indulged in orations, apparently getting very excited.

There were many sick people among them, principally bronchial trouble. They had several medicine dances by the medicine men. At the mouth of the Chena the old chief was sick. All the Indians got in a circle around the fire, under the shelter of birch bark and drilling. The medicine man started slowly around the fire, humming some song, making motions at the fire as if to take up armfuls of it. Soon his voice rose and his movements became more rapid. The old chief squatted inside of the ring with his back to the fire. Gradually the medicine man became more and more excited, the Indians in the circle now croning in low tones. He finally worked himself into a frenzy, running his bare arms into the flames repeatedly, apparently inhaling fire, and rushing to the old chief and blowing the same down his back, lifting his shirt collar to do it. When he had worn himself out roaring, jumping, snorting, and blowing, the circus was over and the chief supposed to be cured. They evidently have little faith in their medicines, for they were anxious for me to get "white man's medicine" from the doctor at the steamboat. I purchased some cough medicine for them from the white men when I returned down the Chena in the lifeboat. The Indians in their canoes were very angry with me because I had not secured flour, butter, and sugar for them. I camped alone,

and went over to their camp in the evening and tried to explain how to take the cough medicine. Passing the bottle to one, he looked at it a moment, took a drink, passed it to the next, and so it went till it was empty. The doctor's directions were one teaspoonful after each meal.

When I got to the mouth of the Chena I found that Blitch and McGregor had been treated royally during my absence. McGregor had traded his watch with the chief for some beaver skins. They were all feeling sullen and resentful toward us, however, when we left on the morning of October 7.

The Lower Tanana Indians live on fish principally, it being a poor country for game. They are much poorer than the Upper Tanana River Indians, and seem less intelligent and active. From the mouth of the Tanana up the Yukon and its tributaries to Skagway we saw Indians at various places, no large number in any one place and no great number in the aggregate. The best looking and most intelligent I saw at Fort Yukon. In general the Yukon Indians resemble the Tananas in size, but their long association with white men has left them very unlike savages as we understand the term. Many are pilots on the river steamboats. All live in good houses and have many of the good things white people have. Their standards of morality are much lower than the Indians who have had less association with the whites. In violation of the laws of Alaska, whisky is sold to Indians, and has long been a demoralizing influence among them. I saw but one Indian in going from Dawson City to Skagway, a distance of 600 miles. He was employed by white people and his name was Schwatka. He had been a guide for Lieutenant Schwatka and was proud to take the latter's name.

CLIMATE.

We found the climate of Alaska a very healthy one. It is almost perfect in the interior. During April and early May on the coast we had a few rain and snow storms. The thermometer ranged from 10° below zero to 60° above.

In June we had very few rains, with the thermometer ranging from 40° to 80° above zero. In July we had several protracted rainstorms. From the 15th to the 25th it rained every day. The thermometer had about the same range as in June. During August we had clear weather until we entered the pass of the Alaskan range; then we had rain,

snow, and hail from August 13 to 23. The thermometer ranged from 20° to 60° above zero.

In the first two weeks of September we had about as many rainy as clear days. From the 15th to the 25th we had several severe snowstorms. The rest of the month was clear and cool, the thermometer ranging from about 10° below to 50° above zero. October was very clear, but each day it was getting colder, the thermometer ranging from 15° below to 35° above zero. The first six days of November were cold, and from 25° to 35° below zero. From the 20th to the 27th of November it was very cold, from 30° to 45° below zero. The month was generally clear, not much snow falling.

Early in December the snow began to fall more steadily. All that fell remained; it was never warm enough to melt it. From December 18 to 23 it was from 50° to 70° below zero. This was the coldest weather experienced. We traveled all this time and slept in a tent, not experiencing any great trouble. We had continuous cold weather till we reached the seacoast, on February 24. It did not snow a great deal. I never saw it warmer than 5° below zero from December 9 to February 24. On Lake Bennett it was 49° below zero on February 13. On February 25 it was 23° above zero at Skagway, just over the Coast range on the seaboard. The latter seemed worse to me than the former, as it was a damp, penetrating cold.

In the interior from 18 inches to 3 feet of fine, powdery snow fell during the winter. On the coast the snow was from 5 to 10 feet deep. I saw very few sick people, save from frostbite, in my journeys. The Indians seem afflicted with bronchial trouble. They believe that by removing their shirts at night around a camp fire and exposing their nude bodies to the flames they can cure themselves. Of course this only increases their sickness.

INSECTS.

Many varieties of butterflies and house flies are found in Alaska. Spiders are plentiful. Mosquitoes and white-legged flies are too numerous, and from June 8 till August 20 we had faces and hands covered to escape the ravages of the latter. It would be idle to attempt a description of the nuisance mosquitoes are in this country. One can not understand where they come from, until you realize the many days that have over twenty hours of continuous sunshine, and that the country

has marshes innumerable, full of heavy vegetation. Coverings of netting for the face and thick gloves should be used during June, July, and August.

CLOTHING.

A campaign hat, a piece of mosquito netting, a blue shirt, corduroy trousers, summer underwear, cotton socks, a good, strong pair of shoes, and a thick pair of gloves are all a man needs in Alaska from June until September. A double outfit like the above ought to last him all summer. From April till June, along the coast, a mackinaw suit, heavy underwear, sweater, woolen gloves, and gum boots should be added to the above. In the interior in winter one needs heavy underwear, sweater, woolen socks, German socks, moccasins (white man's), fur cap and gloves, a parka of drilling and another of fur. The Indian moccasin is worthless, wearing out in a few days. I wore one pair of white man's moccasins from December 26 till March 1, walking over 1,000 miles in them.

A Kenwood sleeping bag will be useful from April till November. In the winter one needs robes under and above him.

LAKES.

Many lakes were seen in Alaska by white men's eyes for the first time last summer. The largest we passed is Lake Louise, about 35 miles long and from 1 to 3 miles wide. Lake Blanche, Lake Adah, and many more, unnamed, were discovered and located by us. We found them generally shallow, and fringed with heavy vegetation and timber; frequently their surfaces were covered by white and yellow pond lilies. The region between the base of the Alaskan range and the head of the Matanuska contains thousands of lakes of all sizes.

RIVERS.

With the exception of the Tanana and Yukon, I found all the rivers of Alaska, crossed or followed, very erroneously mapped, both in length and direction. The Matanuska has heretofore been ignored or unknown by most Alaskan map makers. It comes with its tributaries for about 160 miles from north of east out of the country between the Sushitna and Copper rivers. It is a shallow, muddy, glacial, swiftly flowing stream with high banks, usually filled with sand bars.

Most of its tributaries come from the region between it and the Sushitna. Bubb River and its tributaries find their sources in the mountains to the east of the Sushitna; it empties into Lake Plaveznie, whose outlet stream, the Taxlena, empties into the Copper. It is a clear, shallow, swiftly flowing stream, generally between rolling hills after leaving the mountains. The Gakona flows southeast from the Alaskan range into Copper River. It is a sluggish stream, between low banks, with marsh-colored water. The Upper Delta is a series of lakes, with clear water. About 30 miles from its source it becomes a glacial torrent, muddy and deep. It is almost 100 miles in length, and enters the Tanana through six mouths. The Lower Volkmar flows through a swampy country, with sluggish current and discolored water. The upper stream is very swift, with clear water, and full of rapids. It is about 100 miles long, and flows south of west out of the mountainous country between Tanana and Yukon. The same description fits the Chena. The Tanana and Yukon have already been described by others.

SERVICE OF THE MEN.

Of the men who did the hard work of the exploration too much praise can not be given. While all of us would have preferred duty with our regiments during the Spanish war, we had to be content and do the best we could in Alaska. With the means at hand we worked the best we knew. I would say a word of praise of every man who came under my immediate command or notice. All worked faithfully under trying circumstances.

To Corporal William Young, Fourteenth Infantry, I am especially indebted for hard, conscientious work, good command of his men, and most meritorious services. To Packer John Dillon I owe a great debt of thanks for his assistance in directing and taking care of a poor train of four mules and one horse, getting all there was in them out of each and every animal.

To Privates Daniel McGregor, Company A, Fourteenth Infantry, and Charles Blitch, Company B, Fourteenth Infantry, I am indebted more than I can ever pay. Their loyalty under trying circumstances, their tried bravery and courage, I would respectfully invite your attention to, and, through you, to that of our superiors. I trust they will be

suitably rewarded for the hardship and suffering they endured without a murmur.

To Mr. W. J. Cram, the gentleman who accompanied me out over the ice 1,300 miles, I would express my thanks and appreciation for his excellent and conscientious work. To Mr. H. H. Hicks, who was a guide for our party from the Knik Arm to Upper Lake Plaveznie, I acknowledge great indebtedness. His work and his judgment were faultless. He has a knowledge of the woods second to none I have ever met.

Very respectfully, your obedient servant,

J. C. CASTNER,
First Lieutenant, Fourth Infantry.

LIST OF PLANTS COLLECTED BY LIEUT. JOS. C. CASTNER ON MATANUSKA RIVER, ALASKA, 1898.

Anemone narcissiflora L.
Anemone parviflora L.
Aconitum delphinifolium Reich. (?)
Arabis lyrata L.
Viola glabella Nutt.
Geranium erianthum DC.
Lupinus nootkatensis Don.
Astragalus alpinus L.
Oxytropis lamberti sericea Gray.
Hedysarum mackenzii Rich.
Potentilla nana Willd.
Poterium canadense B. & H.
Rosa nutkana Presl,
Epilobium angustifolium L.
Epilobium latifolium L.
Sedum roseum Scop.
Cornus suecica L.
Viburnum pauciflorum Pyle.
Arnica latifolia Bong. (?)
Vaccinium vitis-idæa L.
Ledum latifolium Ait.
Ledum palustre L.
Moneses uniflora Gray.
Pyrola rotundifolia L.
Trientalis europæa arctica Ledeb.
Polemonium sp.
Mertensia paniculata Don.
Myosotis sylvatica alpestris Koch.
Pedicularis sudetica Willd.
Boschniakia glabra C. A. Meyer.
Pinguicula villosa L.
Rumex occidentalis Wats. (?)
Streptopus amplexicaulis DC.
Aspidium spinulosum Swartz.
Equisetum sp.
Cladonia rangiferina L.

REPORT OF SERGEANT WILLIAM YANERT,

Troop K, Eighth Cavalry, U. S. A.

TYOONOK, COOKS INLET, ALASKA,
September 23, 1898.

TO THE COMMANDING OFFICER, EXPLORING EXPEDITION NO. 3.

(Through the Commanding Officer Sushitna River party.)

SIR: I have the honor to submit the following report concerning a tour of exploration to the Tanana divide which I performed in obedience to instructions given me by First Lieut. Henry G. Learnard, Fourteenth Infantry, hereto appended.

Pursuant to said instructions, accompanied by Private Jones, Fourteenth Infantry, and under the guidance of the Indian "Bate," I left Lieutenant Learnard's camp on the Chinaltno River on the morning of August 12, and proceeded in a northwesterly direction, following more or less closely the left bank of the Chinaltno, a distance of about 12 miles. From this point the route ran to the north, following the divide between the first and second forks of said river, and thence continuing past the head of the second fork, in the same direction, until the middle fork of the Sushitna was reached at a point about 36 miles north of the starting point.

The middle fork of the Sushitna River was here crossed on a raft, the landing being effected immediately below the mouth of a stream known as Indian Creek, which joins the Sushitna from the northwest at a point about 8 miles south of the falls.

The course taken from the mouth of this creek ran in a westerly direction to a range of mountains. These were crossed by way of a pass having an altitude of 3,000 feet, and beyond this range the course again turned northward and continued at the foot of the range to the head waters of the Sushitna River, which is the third fork of the Sushitna. Here the divide was reached and crossed, and on September 3 I

arrived at a river which came from the northeast and making a sharp turn took a northerly direction. This river, the guide told me, is a tributary of the Tanana. I took it to be the Cantwell River.

Upon arriving at this river the guide refused to continue in service as such; I therefore discharged him and, for reasons to be stated later, abandoned further progress. I began the return journey on September 4, going to the mouth of Indian Creek via the same trail over which I had come, thence by raft to the forks of the Sushitna, whence a walk of 5 miles brought me to the point of starting—i. e., Lieutenant Learnard's camp.

I carefully noted the nature of all the country traversed, and feel justified in stating that from beginning to end I found it exceptionally well suited for a summer pack trail. That portion of the route which begins on the Chinaltno and ends where the Sushitna was crossed is, in its present state, fit for such a trail, and an excellent one could there be located and established. I am equally certain that this trail could have its starting point at or near the mouth of the Talkeetno (east fork of the Sushitna), and it would thus cover a distance of 45 or 50 miles.

Concerning the wood supply on this portion of the trail, I would say that a dense forest of pine, spruce, cottonwood, and birch covers all the lowland adjacent to the forks of the Sushitna and extends to the foot of the higher ground to the north, a distance of from 10 to 12 miles. After this timber is passed no wood is found until the Sushitna is again reached; alder and willow bushes, however, are plentiful along the entire distance.

Good water is obtainable everywhere. The footing in the timbered lowland, though not firm, is generally good, and on the upland slate and stone predominate.

The streams in this section are numerous. The largest of these, however, is but 8 yards wide; all have stony beds and are fordable. The altitude of the highest point encountered was 3,100 feet. The descent into the valley of the Sushitna River is quite abrupt, the drop being from 2,700 feet to 750 feet. A fairly gradual grade is, however, possible. The Sushitna River itself presented the only serious obstacle to an animal pack trail thus far encountered. Its width varies from 250 to 600 yards. The current is about 6 miles per

hour. The channel, though greatly divided by gravel bars and wooded islands, is too deep for fording and could hardly be bridged in the usual way on account of floating timber during times of high water.

The ascent of the mountains which were crossed between this and the third fork of the Sushitna was laborious, the Indian trail leading to the pass having apparently been chosen on account of directness rather than ease.

The pass itself is open and free from obstacles and has an elevation of 3,000 feet. Beyond this range the footing is excellent two-thirds of the distance to the point from which I returned. Several very extensive swamps were crossed, the greater part of which could have been avoided. Timber is abundant and within easy reach. Many streams flow from the mountains to the west fork of the Sushitna. Only two of them, however, can prove troublesome during high water, and this less on account of their width than their rapidity. Both of these streams can be bridged with timber growing on their banks.

The divide between the head waters of the west fork of the Sushitna and the river flowing northward is low (2,600 feet), and has the appearance of a valley from 7 to 9 miles in width. A belt of spruce extends across from south to north. A well-worn footpath leads over the divide, and the guide assured me that it was made and used by Indians going to and from the Tanana. He also pointed out the frames of two Indian houses north of the divide, stating that these were used by the Tanana Indians during the hunting season. Moose and caribou signs were plentiful in this locality, and it appeared to be the wintering place of game and other animals.

Upon reaching the tributary of the Tanana the guide informed me that he was not acquainted with a trail from here on, and he gave me to understand that he had made the trips only during the winter on snowshoes. I had, however, good reasons for doubting his word, as will be seen later. As I could not induce him to continue the journey, I discharged him and determined to continue without him. I thereupon followed the bank of said river around to the west, where it made a sharp turn to the north. The Indian, seeing this, called me back and directed me to cross the stream farther up, telling me that I would come upon a trail on the other side. I did so, and shortly afterwards found the trail. In following

this trail I came upon the tracks of a party of white men, whom I guessed to be the party under Mr. Eldridge. Being by this time dependent upon game and berries for subsistence, besides being barefooted, I concluded to abandon further progress, assuming that the remainder of the route would be reported upon by the party ahead of me. I consequently did so, as already stated.

Referring to this river, which I, probably erroneously, took to be the Cantwell, I would say that it is a considerable stream, being at time of flooding about 60 yards wide, nearly 3 feet deep, and of strong and swift current. Its water was nearly clear, the banks timber-clad, low, and stony. Indications of high water convinced me that at such times the width of the river would be more than doubled and that fording would be impossible. The river came from the northeast, out of a long, narrow valley, and upon reaching the foot of a chain of mountains took a decided turn to the north, continuing thus to another range, which it pierced by way of a canyon. It was joined near the turn by a considerable tributary, whose head overreached that of the Sushitna, and by another and larger river just previous to entering the canyon.

The Indian had intimated to me that the Tanana is reached in three and one-half days from where this river was struck, and I might have been able to reach the same had I been equipped with a couple of pack animals.

As concerns the Indian's refusal to remain in service as guide, I feel certain that his unwillingness to do so was prompted by fear of the Tanana Indians, who, he frequently assured me, were very numerous and bad.

In speaking of the animal-food supply which this section affords, I would state that hay of fair quality can be made on and in the vicinity of all swamps. Grass is quite abundant in the timber, in gulches, and on the lower slopes. Reindeer moss grows everywhere above the timber line, which appears to range between an altitude of from 1,900 to 2,200 feet. Moose, caribou, bear, marmots, ground squirrels, ptarmigan, and blue grouse are obtainable, and especially so near the divide.

Several varieties of berries grow in vast quantities on the uplands and mountain slopes. I noted the blueberry, huckleberry, mossberry, and thimbleberry there; high-bush cranberries, red currants, and raspberries were plentiful in the

timber. Fish, such as three species of salmon and two of trout, were seen by me in only two streams, the Chinaltno and Indian Creek.

Waterfowl were exceedingly scarce throughout. Song birds were entirely wanting, but several varieties of small forest birds were observed. Insects were plentiful and annoying. These were the mosquitoes, black flies, gnats, and small spiders. I do not possess a sufficient knowledge of minerals, and can not, therefore, speak of them. I noted that slate was the chief formation east of the middle fork of the Sushitna, and granite, slate, and black rock to the west of it. Coal, such as is found on the shores of Cooks Inlet, exists in large quantities on the Chinaltno, the Middle Sushitna, and on one of the tributaries of the west fork of the river.

A mining party of six men were engaged on the Lower Chinaltno, who had taken enough gold from the river to warrant operations. A similar party was found encamped at the mouth of Indian Creek, who were unable to do any work on account of high water.

I am, sir, very respectfully, your obedient servant,

WILLIAM YANERT,
Sergeant, Troop K, Eighth Cavalry.

CAMP ON THE CHINALTNO RIVER, ALASKA, *August 11, 1898.*

TO SERGEANT WILLIAM YANERT,
Eighth Cavalry.

SERGEANT: To-morrow, the 12th instant, you, with Private Jones, Company D, Fourteenth Infantry, and "Bate," a Skittig Nation Indian, as guide, will leave this camp en route to the Tanana River, taking with you all the rations you are able to carry, these to be used by you and Private Jones. In case of your safe arrival on the Tanana River, you will, if possible, return to this camp in company with your guide, or, if you deem it safe and he will not come when you are ready, you are authorized to return without him, traveling, however, over the trail previously traveled. If before reaching the Tanana River you consider it too hazardous to proceed, you will return to this camp; and if upon arrival at the Tanana you then consider it inadvisable to return, you will proceed down the river to the Yukon and thence to St. Michaels, reporting upon arrival to the commanding officer of that post; but in the latter case you will send a report of your safe arrival to the Tanana River by some Indian courier to this camp, or, if there is no camp here, then to Sushitna Station.

You will make the topographical map and reports of the country required in G. O. No. 8., c. s., Department of the Columbia. The camp at this place

will be kept up until September 15, or until the ice renders it necessary to descend. In case you have not returned by the time the camp is broken up, rations will be left for you in the cache on the ridge, and notice of the breaking up of the camp will be posted at our former camp, at the mouth of the Talkeetna River, and in which case upon your return you will proceed to Sushitna Station and thence to Tyoonok, unless further instructions are found by you at the cache.

The Indian guide is to receive $20 for piloting you to the Tanana River and back here. I will provide you with my own money to pay him, which payment can be made in part on arrival at the Tanana or all at this place upon your return. Some money ($30) will be given you to meet any emergency that may arise, while a check of my own, to be used only in case you can not get to St. Michaels without it, will also be given to you. In case any emergency not provided for in this letter arises, or you deem it best to deviate from these instructions, do so, as the person in the field and an unknown country, beyond all communication, as you will be, is the one who must determine what is the best course to follow.

H. G. LEARNARD,

First Lieutenant, Fourteenth Infantry,
Commanding Detachment, Exploring Expedition No. 3.

[A true copy.]

REPORT OF SERGEANT FREDERICK MATHYS,

Fourteenth Infantry, U. S. A.

CAPT. E. F. GLENN,

Commanding United States Army Exploring Expedition No. 3.

JULY 31.—I took charge of the detachment to-day, but did not move from camp for the reason that all of our time was consumed in looking for the mule which had strayed from the train on the day before.

AUGUST 1.—Accompanied by Mr. Bagg and the Indian, we started on the trail at 7 o'clock and succeeded in cutting out the trees and underbrush for about 5 miles. A short distance after starting our trail led us directly from the river up on to a flat about 400 feet high, over which we traveled for a distance of about 2 miles, in the center of which we found an Indian cache. We crossed a small, clear stream, a tributary of the Chicaloon, about half a mile from its mouth. This stream flows in a southeasterly direction, is not very deep, but has a very swift current, the descent and ascent to its level being very steep and rough. This entire flat is covered with a heavy growth of spruce, cottonwood, a few birch, and some underbrush, including berry bushes, etc. After passing this small stream for a short distance we found the trail to be very swampy. The remainder of the trail presented little difficulty, as we encountered only a trifling amount of windfall, which we cleared very easily. We went into camp at 3 p. m. and very soon afterwards the pack train arrived. We found grass and good, dry wood in abundance. The distance traveled, 5 miles.

AUGUST 2.—The trail to-day runs in a northerly direction, along the Chicaloon River, and, being an old Indian trail, is in very good condition, except in a few places where the river has cut into the bank and destroyed it entirely, forcing us to travel up the bed of the river, the banks of which at

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these places are not very high. We crossed only two tributaries of the Chicaloon to-day, both of which are glacial streams easily forded. The beds of both of these streams are thickly covered with float granite. About 10 miles from our first camp we crossed the dry bed of a stream which is full of bowlders of all kinds, with practically no water in it. Our journey to-day has been through a rolling country, with a great deal of timber of the same species as that of yesterday and a large number of berry bushes, particularly blueberries, currants, and mossberries. Although the soil is light and thin, yet we found plenty of good grass for our stock. Distance traveled, 11 miles.

AUGUST 3.—We found the animals to be quite footsore this morning, due to having traveled unshod over the rough stones on the trail, and particularly in the river beds of the day before. The formation of the country passed through to-day seems to consist principally of gray quartz mixed with granite. We found plenty of signs of mountain sheep on our side of the stream, and large numbers of them were in sight all the time on the other side of the river.

AUGUST 4.—Broke camp at 7 o'clock, traveling nearly due north, with practically the same class of country as on the day before yesterday. We crossed three tributaries of the river to-day, the first being clear water, the second a large and very swift glacial stream, the third small and of clear water. In each we found float granite and quartz.

AUGUST 5.—The feet of all my animals are in very bad condition from traveling on the rocks yesterday. As it rained nearly all day, we did not break camp at all, but all of us went out prospecting the country. I discovered a vein of coal running across the ridge, which was 4 feet in width and apparently a very good quality of soft coal. The Indian killed a black bear, but none of the party seemed to enjoy its meat except himself.

AUGUST 6.—On account of heavy rain we were compelled to stay in camp. Some of our rations got quite wet, also our tobacco and matches.

AUGUST 7.—Continued to rain all day, so that we could not move without getting every particle of our provisions wet. Some of our party panned some of the sand on the bars, but could get no colors. In the afternoon we went out and cut a trail around an earth slide.

AUGUST 8.—We started out early in a light rain, our trail leading nearly due north for about 6 miles. From that point on nearly due east. We crossed the river at the bend. Up to that point there is timber along the river (spruce, cottonwood, and birch), and berries are getting more numerous as the timber decreases. Crossed a number of small streams on the left-hand side of the river, all of which are clear water. On the right-hand side we crossed three quite good-sized streams, all of which gave evidence of carrying large quantities of water at times. We went into camp at the right-hand side of the Chicaloon, where we found plenty of grass and wood in a spruce and cottonwood grove. The stock was still very footsore and the men's shoes were practically worn out. My own are simply hanging together. Came near losing one of our horses, due to his having fallen into the stream. Fortunately he managed to get out, as did also Private Dillinger, who was riding him at the time. The only portion of his pack that got wet was the sugar. We see plenty of black bear in this section, and find also plenty of blueberries and currants.

AUGUST 9.—We traveled 6 miles to-day, which carried us to the foot of the divide, having crossed the river and camped in the last timber (small cottonwood) to be found on the Chicaloon River. A few stumps indicate that some fir grew at this place at one time. The river at this point has a very wide bed and is subject to frequent overflow, and evidently changes its channel from one bank to the other quite frequently. The beds of all streams are covered with rock presenting the appearance of cement mixed with coarse gravel. After going into camp I went up the divide, found the ascent was very steep, covered with sharp rock which presented the appearance of having been broken up artificially. The top of the divide is nearly level, but is cut through by several canyons with almost vertical banks. The river makes a turn due north just above my camp, and there is a glacier just at the end of the Chicaloon, about half a mile from here. Quite a large stream comes out of that glacier and into the Chicaloon just above our camp.

AUGUST 10.—Sent a packer and guide, with one shod animal, up on the divide to ascertain if it were possible to avoid the canyons, which they succeeded in doing by passing around the heads of them. The guide did not return until

after dark, and reported that he had been unable to find a trail down to the Talkeetna River or its tributaries, because each of these run through box canyons with nearly vertical walls. The Talkeetna River is a tributary of the Sushitna. The stock broke into our rations this afternoon and destroyed one sack of our flour.

AUGUST 11.—Accompanied by Private Ayres, I went over the divide, a distance of 14 miles, and arrived at the head waters of the Talkeetna at 4 o'clock p. m. Went into camp between two large glaciers at the junction of the streams flowing from them.

AUGUST 12.—After traveling about 4 miles found a place to get down to the river. There is an Indian or game trail that leads down at this point to a low, flat country which is well timbered with spruce and cottonwood, and in this flat a tributary of the Talkeetna coming from the lake flows into the main stream. After discovering this trail, we turned back to the main camp, carrying in addition to our packs about 50 pounds of meat cut from the caribou killed yesterday. We managed to reach this camp the same evening.

AUGUST 13.—An examination of our Indian by Mr. Bagg, the guide, reveals the fact that he (the Indian) has a very dim recollection of this country. He states that he traveled over it in the winter season, when he was without rations of any kind, and that he has not been over this trail since that time, fifteen years ago.

He consumed eight days going up the Talkeetna on snowshoes from the point where he struck it, and below which point he knows nothing of the river. I calculate that from here to Vasili's cabin it will require twenty-five days' travel with a pack train, since it will necessitate cutting of trail and construction of rafts for crossing the streams. The Indian also informs me that the other Indians will not stay in this section of the country for fear of getting snowed in, and that we are liable to have heavy snowfall within two weeks. Deeming it impracticable to take all of my party over, I decided to send a guide and one man across, giving them two animals, and with instructions to prospect the head waters of the Talkeetna River. It rained to-day.

AUGUST 14.—As it is necessary to have a clear day to take the stock across the divide and it is still raining, we decided to remain in camp and put in the day hunting.

AUGUST 15.—Mr. Bagg, the scout, is sick and unable to travel. We put in the day repairing our shoes with rawhide cut from one of the kyaks. It rained to-day.

AUGUST 16.—The guide is still sick and unable to travel. I went up onto the glacier alone, but it was too foggy to see anything.

AUGUST 18.—As this is a clear day, we put in the time airing our bedding and drying our provisions, also getting ready to move to-morrow, when I shall send the packer and Indian out with instructions to go up Canyon Creek and thence east, if possible, as far as the stream, which the Indian reports to be a branch of the Sushitna River. Will give them ten days' rations, and instruct them to follow the Indian trail.

AUGUST 19.—The guide, accompanied by Private Dillinger, started out across the divide with two animals, both of which are loaded very light. The horse, being shod, passed over the country without any trouble, but the mule, being barefooted and tender-footed, caused considerable trouble in making the ascent. Went into camp in a well-protected spot, with plenty of grass and fuel. Found large quantities of berries and currants and also an old Indian cache in this flat. As the stumps of all the trees that have been cut down here are very high, I infer that the Indians use this for a winter camping place.

AUGUST 20.—I gave the guide instructions to proceed down the Talkeetna as far as possible, making use of the animals if practicable, report upon the condition of the country and river, and to return to the main camp on the other side of the river not later than September 2. I then returned to the main camp, and found that the packer and Indian had left on the day before.

AUGUST 21.—Was unable to do anything to-day, as my feet were in bad condition, due to the sharp rocks over which I traveled yesterday. I was reduced to moccasins, as my shoes were worn out.

AUGUST 22.—The packer and Indian returned to-day, and reported that they were unable to take the stock up Canyon Creek, as it runs through a box canyon, with vertical walls, and that they had gone down the Chicaloon and examined some other creeks, but without success. They brought into camp two mountain sheep, the meat of which we found to be far superior to that of the caribou.

AUGUST 23.—Sent Private Ayres over to the camp on the Talkeetna. He is wearing moccasins made from the kyak. All of our party, with the exception of the guide, are wearing moccasins constructed by us.

AUGUST 24.—Attempted to make an examination of the mountain range to the north, but was unsuccessful on account of the fog and rain. Private Ayres returned about dark, reporting that the guide was still in the camp where I left him.

AUGUST 25.—Sent Private Ayres and the packer to examine the north side of the glacier. Although they succeeded in getting about 10 miles from camp, the crevasses in the ice cut off further progress, and they were unable to determine the extent of the glacier. It is more than probable that King Creek, the Chicaloon, and the three branches of the Talkeetna rise in one glacier or branches of the same. This party reports having found some float quartz.

AUGUST 26.—Very foggy, and rained all day, so did not move from the camp.

AUGUST 27.—Decided to return to-day. Moved down the river 7 miles. Had some trouble in crossing the streams, which I found to be somewhat more swollen than when we crossed coming up.

AUGUST 28.—The guide and Private Dillinger returned to the camp. They camped about a mile above my party last evening. The guide reports having thoroughly prospected the head waters of the Talkeetna, but found no gold, although he found plenty of quartz containing iron and other metals; that he had gone down the Talkeetna about 10 miles, but was unable to proceed farther on account of deep cuts and canyons; that the valley of the Talkeetna is about 9 miles wide at a distance of about 20 miles from its source, and that it slopes gradually to the mountains on either side; that there is plenty of timber in this valley, principally spruce; that he also found plenty of berries, principally blueberries and currants; that the soil is very heavy and of a reddish color. My packer was taken sick to-day with cramps of the stomach, which we cured with hot-water applications and rubbing.

AUGUST 29.—Moved down the river about 18 miles. It rained slightly all day.

AUGUST 30.—Traveled about 15 miles. Went into camp about a mile above the point where Captain Glenn crossed the Chicaloon. The grass was excellent. Met three Indians from the Knik.

AUGUST 31.—Split up my party at the crossing of the Chicaloon, giving the guide and packer five animals, with instructions to go out on Captain Glenn's trail for the purpose of caching provisions for the use of his party upon their return. I instructed them to make one cache at a distance of about 30 miles from the crossing and another at a distance of 60 miles, and left it to their discretion whether they should return to the Knik Arm or wait for the return of Captain Glenn and party. With the remainder of the detachment and four animals I returned to King Creek (at mouth of Youngs Creek).

SEPTEMBER 1.—Traveled to Moose Creek.

SEPTEMBER 2.—Reached the cabin at the head of Knik Arm, where I discharged the Indian. My reason for not reaching my destination (Vasili's cabin) was my inability to take unshod stock across the divide. My reason for not communicating with Lieutenant Learnard, as instructed, was lack of time to get back before snow fell, that the Indian knew nothing about the country, and lack of foot-wear. I inclose extracts from report of Mr. Bagg, who was with me as guide.

Very respectfully, your obedient servant,

FREDERICK MATHYS,
Sergeant, Fourteenth Infantry.

REPORT OF GUIDE JOHN S. BAGG.*

CAPT. E. F. GLENN,
Commanding Exploring Expedition No. 3:

I respectfully submit the following statements of my movements and observations from July 31, 1898, the date on which I left your command at Chicaloon Crossing, to August 31, 1898, the time of my return to the same point:

CHICALOON RIVER, AUGUST 1.—Rain. We proceeded up the river bottom a few hundred yards, at which point the trail turns abruptly to the left and goes up a steep hill. After climbing about a quarter of a mile it enters a fine little valley about 2 miles in length. About halfway up the valley, and a short distance to the left of the trail, is an Indian cache—structure in good repair—near which can be found good water. After leaving this valley the trail bears to the right for a short distance and descends abruptly to a clear and rapid stream, which I have named "Four-Mile" Creek. From there we came a mile through a rougher country, requiring much chopping and moving of fallen timber, reaching a good camping place, with abundant grass for our animals, on the bank of the Chicaloon. The trail we have made to-day is well marked with blazed trees, and can be followed without difficulty. Our general course north (magnetic).

CHICALOON RIVER, AUGUST 2.—Rain. The trail has followed the river bottom most of the distance, and the going has been comparatively good, our course being north. We notice from day to day a marked decrease in the number of mosquitoes. A week's time will no doubt rid us of them entirely. The mountains on either side of the Chicaloon are rugged and precipitous. The rock formation is of a sedimentary character, and consists of a brown sandstone varied

*Mr. John S. Bagg, who was employed by me as guide for the exploring expedition of Sergeant Mathys, is an experienced mountaineer and prospector. I have stricken out from his report such matter as was covered by Sergeant Mathys, and the remainder is given in his own language.—[NOTE BY CAPTAIN GLENN.]

by an extremely hard conglomerate. On the gravel beds along the river I find, by panning, that the stream carries a little gold, but the particles are extremely light and fine and of such a character as to make it improbable that any pay dirt can be found on this river or its tributaries. The timber and vegetation over which we are traveling is of the same character as on the Matanuska, but grows less in size and luxuriance as we attain an increased elevation.

CHICALOON RIVER, AUGUST 3.—Fair. We did not move camp to-day. The water of the Chicaloon River has a milky look, does not settle or become clear when allowed to stand in a bucket, and is, no doubt, of glacial origin.

CHICALOON RIVER, AUGUST 4.—Fair. We traveled 10 miles to-day over a good trail, mostly in the river bottom, our course continuing to be north. After coming 5 miles we came to a stream of considerable size flowing from the northwest, which I have named Moss Creek. About 4 miles farther on we came to another stream of about the same size and flowing from the same direction (northwest), which I have called Ice Creek. Both of these streams must carry large volumes of water at certain periods, this being indicated by the immense amount of wash gravel and bowlders deposited along their present channels. The country through which we have traveled to-day is carpeted with a thrifty growth of reindeer moss. There is a marked decrease in the size of the timber as we go north. Our stock is finding ample feed and is doing well. It is most gratifying to learn that pack animals can be handled so easily and made so serviceable in this country. During twenty-five years' experience in prospecting and mining in all the Western States and Territories I have never explored a country in which horses can be used to better advantage. I have seen less than a dozen birds since leaving tide water—two or three ravens, an old-fashioned robin redbreast, a pair of camp birds, and a small, little yellowish bird which resembles the well-known sapsucker.

A noticeable change has occurred in the nature of the rock formation. An eruptive rock, quartzose in character and highly mineralized with iron sulphides, makes its appearance on the rim of the canyon. The sandstone is being displaced by granite, and it is evident that we are entering a country that may contain possibilities for the prospector.

CHICALOON RIVER, AUGUST 5.—Rain. We did not move camp to-day.

CHICALOON RIVER, AUGUST 6.—Rain. In the afternoon I took a trip up the mountain to the northwest. From the farthest point I reached I sighted a large glacier about 2 miles distant, which is no doubt the head of Ice Creek, that flows into the Chicaloon a mile below our camp. I find that wild flowers are much more varied and abundant on the uplands than in the valleys. I was surprised this afternoon to find the golden-rod and the never-to-be-forgotten "forget-me-not."

To the west of the river the sedimentary formation has disappeared and been replaced by granite rocks. Much mineralized quartz makes its appearance in irregular and detached masses, the formation at this point having been too much disturbed to admit of any regular or continuous veins.

CHICALOON RIVER, AUGUST 7.—Rain. In the afternoon we went out and opened a couple of miles of trail.

CHICALOON RIVER, AUGUST 8.—Rain. We came 9 miles to-day over an easy trail, which kept us most of the way in the river bottom. We are camped opposite the mouth of Canyon Creek, which empties into the Chicaloon from the east at this point. The Indian informs me that this is a favorite hunting locality during the fall and winter. We saw three black bear and five sheep to-day. I observed a large glacier this afternoon, which is located about 8 miles south of the mouth of Canyon Creek and 3 miles east of the river.

CHICALOON RIVER, AUGUST 9.—Fair. We came 5 miles to-day, and have reached a point, near the head of the river, where the trail leaves the canyon and runs over the pass to the Talkeetna. It is clear and pleasant this evening, the air being dry and bracing. We are camped on the east bank of the river in a bunch of cottonwood, which is the last timber of any sort on the Chicaloon.

CHICALOON RIVER, AUGUST 10.—Fair. We did not move camp to-day. I struck out soon after breakfast and went over the pass toward the Talkeetna. I had a very long and tiresome trip, having traveled, as near as I can estimate, about 30 miles. I did not reach camp until 9.30 p. m., when I found everyone in bed and no camp fire. I make the trail to be 14 miles in length from where it leaves the Chicaloon until it strikes the Talkeetna River. The pass can be easily traveled by man or beast, and a half dozen men in as many days could lay out a

trail that would make easy work for heavily loaded pack animals. While crossing the pass I was pleasantly surprised to find dandelions in bloom.

The Talkeetna has its source in an immense glacier, from which it flows north about 5 miles, thence northwest for about 20 miles, thence turning sharply to the southeast. These estimates of distance and direction seem to be fairly accurate, as I had a good view of the country from a commanding position. We can, no doubt, get over the pass all right with our pack outfit, but our Indian claims that we must cross the river and travel down the left bank, and I am doubtful about effecting a safe crossing, as the river is very high at present. However, I do not take much stock in the Indian, and it is more than possible that I may be able to figure out a trail on the right bank.

CHICALOON RIVER, AUGUST 11.—Fair.

CHICALOON RIVER, AUGUST 12.—Fair. In the evening the Sergeant and Private Ayres returned, bringing caribou meat with them. It is watery and is not fat, and is altogether the poorest wild meat I have ever eaten.

CHICALOON RIVER, AUGUST 13.—I thought that the day's delay would give me an opportunity to explore the Chicaloon Glacier, and found it of much greater magnitude than I had anticipated. The lower end of it is about 1 mile south of our present camp. It extends up the mountain for a distance of 7 or 8 miles to the summit of the range, and is from 500 to 2,500 feet in width. Its apparent thickness is not less than 200 feet at the lower end, and it is no doubt much thicker in most places. It extends north and south and resembles an immense frozen water course. About 2 miles from its lower end an apparent offshoot or branch occurs, which extends for about 3 miles up a steep canyon to the left, and has a very massive and imposing appearance. I found to-day some fine-looking quartz containing iron and copper pyrites.

CHICALOON RIVER, AUGUST 14.—Rain. It is 7.30 p. m. and raining hard. We have arranged to go over the pass to-morrow, but if the foul weather continues until morning we shall not start, as the Sergeant declares he will not endanger the animals by letting them go over "while the rocks are wet and slippery."

I learned to-day that "Talkeetna" means plenty of food, or provisions. It flows through a country well stocked with

game, fish, and wild fruits, and the Indians have accordingly named it the "River of Plenty." I am much discouraged because of the thick and foggy weather, which makes exploring an impossibility. The leaves are all beginning to turn, although we have had no frost. Mosquitoes are forgotten, and the terrible flies, of which we have heard so much, have not yet put in an appearance.

CHICALOON RIVER, AUGUST 15.—Rain. Nothing done.

CHICALOON RIVER, AUGUST 16.—Rain. There seems to be no prospect of moving camp or doing anything.

CHICALOON RIVER, AUGUST 17.—Rain.

CHICALOON RIVER, AUGUST 18.—Rain. I am beginning to despair of accomplishing anything in the limited time left, as we are to start back to the coast by the 2d of September. Thus we are compelled to leave our field of operations at the very beginning of the season most favorable for energetic exploring and intelligent observation. Men who are familiar with the climatic conditions in this country tell me that after the rainy season is over there follows a month or six weeks of clear, cold weather, during which time prospectors and explorers can accomplish more than during all the balance of the year. On a clear day, by climbing one of the higher peaks, one can gain more information as to mountain ranges, passes, and water courses than by a month's hard work during the thick and foggy weather.

PARADISE POINT, TALKEETNA RIVER, AUGUST 19.—Fair. Left camp on the Chicaloon River at 9 a. m. and reached this point at 5 p. m. We met with several delays on the trip, and the distance could be made in much less time. The sharp rise of about one-half mile after leaving the Chicaloon will not admit of heavy loading in its present unimproved state, but with very little labor a first-class trail could be located that would accommodate a well-loaded pack train. The trail runs in a northwest direction over a rolling country, which is entirely devoid of timber until this point is reached, where a medium-size growth of spruce and fir is encountered. The uplands are completely covered by a thick matting of reindeer moss, and caribou signs are seen on every hand.

PARADISE POINT, AUGUST 20.—Fair. Breakfasted at 5 a. m. The Sergeant started immediately after he had eaten, and within 500 yards of my camp killed a reindeer doe, which he turned over to me. This camp is situated between Talkeetna River and Clear Creek, immediately above their point

of confluence, the former flowing from the south and the latter from the northeast. The source of each is about 10 miles distant from this place, and both are of glacial origin. From the high cliff or bluff which forms the southern boundary of Paradise Point a commanding view was had of the river and valley for a long distance, its source being northwest for about 15 miles, thence turning abruptly to the southwest. The river bottom is broad and gravelly, and is flanked by a considerable growth of spruce and fir timber, which rises with an easy slope until it merges into steep hills and mountains, which are bare and devoid of timber of any sort. The Talkeetna Valley is evidently a great game country, and this point has at one time been much used by the Indians as a camping spot for fall hunting. A well-constructed cache and many old frames for stretching skins bear witness to this fact. The point contains about 160 acres, and is an ideal camping spot. The food here for our animals is abundant and of good quality. In fact, we have had no trouble on that score during the entire trip, and it is evident from our experience that pack animals can be used to great advantage during the months of June, July, August, and September.

PARADISE POINT, AUGUST 21.—Rain. I have done considerable prospecting and panning, but have not succeeded in raising a color, which is a matter of much surprise, as the conditions here are most favorable for gold. The country rocks in this locality are granite and porphyry, and there is a great deal of good-looking quartz in the river bottom. From the general appearance of this section, as far as observed, I regard it as a good field for prospecting, and regret that my time is so limited that more thorough investigation from a mining standpoint is impossible.

PARADISE POINT, AUGUST 22.—Rain. The fog was so dense that I was compelled to forego a contemplated trip to the head of the river. I spent most of the day in prospecting in the immediate neighborhood.

PARADISE POINT, AUGUST 23.—Rain. I had a long trip up the river to-day, and had a look at the glacier, which is not so extensive as the one at the head of the Chicaloon. I thought to find an upper crossing to the river, but did not do so. Our Indian claims that the trail follows down the left bank of the river; and if such be the case, a crossing well up

the river would be an advantage. But from my own observation I am inclined to think the right-hand bank is the better for the pack outfit. I am sure that such is the case for at least 25 miles, and the general contour of the country from the river, as seen from this point, leads me to think that the going is good on the right bank for a much longer distance.

TALKEETNA RIVER, AUGUST 24.—Rain. Received a verbal message from the Sergeant to the effect that if it did not stop raining I had better return across the pass at once. After Private Ayres left this morning I packed up and crossed Clear Creek with difficulty, moved a mile down the river and went into camp.

TALKEETNA RIVER, AUGUST 25.—Fair. Made an early start down the river. The first 2 miles below Paradise Point are the most difficult. Some little maneuvering would have to be done to get through with pack animals. After this has been passed one can take his choice between the river bank or river bottom and go along for 5 or 6 miles with ease. From what I could see ahead of me, I should say that the going is good for 25 miles farther down.

The river for a distance of 7 or 8 miles runs through a gravelly bottom which varies in width from 50 to 750 yards. The river itself occupies but a small portion of this bottom, and when it is concentrated in its channel is never more than 100 feet wide. It flows swiftly, and at this season of the year one should have good judgment in selecting a crossing for animals. About 10 miles below Paradise Point I encountered a comparatively large stream flowing in from the east. I have named this "Aspen Creek," as a small growth of aspen occurs at this point, the first I have seen on this side of the divide. As the atmosphere was clear, I could get a good view of the country for a long distance. The mountains to the northwest at a distance of about 50 miles from here are low and have long and gradual slopes, and at one point in particular there is a very low pass which seems to be easy of approach.

PARADISE POINT, AUGUST 26.—I moved camp this afternoon back to this point.

CHICALOON RIVER, AUGUST 27.—Fair. Crossed the pass; traveled 5 miles down the Chicaloon; went into camp at 5 p. m., having been 9 hours on the road.

CHICALOON RIVER, AUGUST 28.—Reached Sergeant Mathys's camp at 8 a. m.

CHICALOON RIVER, AUGUST 29.—Rain. We got an early start this morning, coming down the river 18 miles. Animals were on their back track and making quick time. There has been a drizzling rain all day and traveling has been most unpleasant, but the rain does not seem to cut any figure, now that we are on our back track. It seems no trouble to get over the country, now that we are homeward bound; and if we had shown half as much energy in getting into the interior as we are displaying in getting out of it we would have accomplished more satisfactory results.

INDIAN CACHE, AUGUST 30.—Traveled 13 miles. Camped at an Indian cache 2 miles above Chicaloon Crossing, the point at which we separated from your command on July 31.

The pencil sketch of the route inclosed herewith.

Very respectfully,

JOHN S. BAGG.

REPORT OF MR. LUTHER S. KELLY.

CAPT. E. F. GLENN, U. S. A.,
Commanding Exploring Expedition No. 3.

SIR: I have the honor to submit herewith a report of a reconnoissance made from this point (Cabin Creek, on the north side of Portage Bay, Alaska), commencing on the 20th day of May, 1898, and completed about the 1st of July.

Cabin Creek, fed from a dead glacier, flows through a valley about 2 miles wide and is about 3 miles long. The sea front has a fine gravel beach and sufficient depth of water for the largest boats that ply in Alaskan waters, and is in every way adapted for the location of docks, wharfs, etc. Good anchorage can also be had at this place, and it has a well-protected harbor.

I left my camp on the morning of the 20th of May, with one companion. We proceeded in a northerly direction 6 miles to the summit of the pass, which was ascended with some difficulty on account of having to break a trail through the soft snow. The descent on the farther side is gradual into a valley north-northwest 4 miles to the point where we first encountered spruce timber. From this point the direction of the stream down which we were going was west-northwest and about 6 miles to where a body of water was visible from the summit.

We traveled 2 miles and went into camp for the night, in heavy cottonwood timber. Leaving our packs in this camp, we traveled on snowshoes 4 miles to a beautiful lake running north-northwest 4 miles.

The mountains slope down to the edge of the lake, and on the right-hand side numerous snowslides occur. The lake being frozen over, we proceeded on the ice to its foot. This lake is about 1 mile wide, fringed with spruce and heavy cottonwood timber at each end. The outlet is a smooth-flowing, low-banked stream, 30 feet wide. Proceeding northeast 1½ miles through the cottonwood timber, we ascended a dead glacier, which gave us a good view of the surrounding country. The valley from the outlet of the lake appeared to be

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about 2 miles wide, is heavily timbered, and extends about 12 miles south-southwest to a large body of water (Turnagain Arm). Directly north of us appeared an opening in the mountains that promised an outlet to the country beyond, and the main stream (Twenty-Mile River), partly hidden by a spruce ridge, evidently came from that direction. A branch of this stream coming in from the west was also observed. From this point we returned to camp, and the next day, the 22d, to our camp on Cabin Creek.

No trails or other evidence of people having visited that section were observed. Since making this journey a nearer and lower pass was examined, to the left of the route traversed by us on this trip, via a branch of the Twenty-Mile River which enters the lake at a point farther down. This pass was noted before, but continuous fog and snowstorms had prevented us from making an examination of it.

The ascent and descent of the pass through the range from Portage Bay does not present any great difficulty for establishing a practicable pack or wagon route, and I believe a railroad could be built over this route. The rock is a slate, and easily worked, and there are no glaciers to interfere with a permanent route over this pass.

On May 29, in accordance with your written instructions, I returned to Cabin Creek to make further investigation of this route. On the 30th and 31st of May, with the aid of a detachment of four enlisted men of the command, we transported all our supplies to the vicinity of Lake Glenn. From this point the detachment returned to Cabin Creek, while Lampe and myself constructed a raft and with some difficulty freighted our supplies on it to the foot of the lake. Our main trouble was with the ice which was collected at the lower end of the lake, through which we had to hew our way for a distance of about half a mile. We then established our base camp near the foot of the dead glacier above referred to, on June 2. Next morning we started, with packs on our backs, over the glacier, intending to make a short cut due north to the opening in the mountains I wished to examine. But the course we followed soon became so perilous, by reason of clear ice and crevasses, that we were compelled to drop everything except our snowshoes. We then proceeded via the spruce ridge to the middle fork, or main stream, of the Twenty-Mile River, up which we had fine walking on the gravel bars, and

which brought us in 9 or 10 miles to the canyon at the foot of another glacier. This glacier rises abruptly in a series of cascades and, so far as we could observe, forms a solid glacier in the system to the north of Portage Bay, and probably beyond. We were unable to get a satisfactory view of the pass, although we climbed well up on the mountains, so we returned late at night to our camp.

On June 4 we moved camp to the mouth of the canyon, where for several days we were unable to pursue our work of exploration, and could not reach the summit of the mountain, 5 miles distant, on account of the continued rain and snow storms, which were accompanied by heavy fog.

On June 9, having moved some of our supplies from the base camp, we attained the summit of the pass with difficulty. Our trail was up a gradual rise, through timber, to the snow line. On reaching the summit we found a glacier, though a trail can easily be found around it. From the summit we proceeded about 2 miles to a rocky point, which gave us a splendid view of the country beyond. Due north about 10 miles lay an immense basin, very low, fringed and shut in by a high range of ragged peaks. This basin was nearly filled by a flat glacier, which formed a lake at its southwest extremity. The outlet to it appeared to be on the west side of the basin, which was 15 or 20 miles in width. With the glass a wooded gulch appeared on the north side, about 20 miles away, and this was the only sign of timber seen in this region of bare rock, ice, and snow.

Observing a rocky ridge to the left of the summit which extended toward the lake below, I determined to examine the west branch of Twenty-Mile River, as it appeared to have a favorable pass opening upon this ridge. The country to the northeast of the summit to Twenty-Mile River, as seen from that point and the higher points en route, is of the most forbidding aspect, forming an impassable barrier of glaciers and high mountains, with their peaks protruding through the ice. Fresh trails of so-called glacial bear and wolves were seen there, but no other sign of life except marmots and a few ptarmigan.

The next few days were spent in returning to the forks of the river and working our way up the west branch. High water, which at this time flooded the streams, compelled us to work our way through tag-alder bogs and pass dangerously near

snowslides. In consequence we were unable to exceed 3 or 4 miles per day; besides, the heat and mosquito pest in all its fury assailed us and added very greatly to our discomfort. The main stream of this branch runs through the canyon, and the pass is impracticable on account of the glacier. In going up this stream we were forced to climb several snowslides in order to avoid side canyons that jutted into the main stream, and which we finally crossed where a snowslide had formed a bridge. To the west I found a pass leading to Winner Creek (a tributary of California Creek), and which appears to be the only available pass for a continuance of the route from Portage Bay to Knik Arm. From Lake Glenn the proper course is westerly across the main stream (the Twenty-Mile River), thence up the right bank of the west branch to the pass, over a comparatively level ground, which required the cutting of some brush. By means of a winding trail the ascent and descent of the pass is easy, as timber extends nearly to the top, and, while the snow was very deep on the summit, we found no glaciers nearer than 2 miles. The valley of Winner Creek falls gradually to California Creek, a distance of about 8 miles, from which point I saw a favorable pass up Snow Creek, but which I was unable to pursue at this time by reason of a shortage of provisions, which compelled me to return to the main camp at Ladd's Station.

On the 22d of May, in company with Mr. Mendenhall, of our party, I crossed Turnagain Arm in a small boat, took up the trail from the point I had left off, and proceeded to the summit of Crow Creek, where I found a favorable pass, with fairly good traveling and gradual ascent. The descent on the other side not being difficult to Raven Creek, which runs due north for 7 miles to Yukla-hitna River, a trail can be easily worked down the right bank of this gulch. The distance from Winner Creek to Yukla-hitna River is about 13 miles, and the altitude of the summit of Crow Creek, as determined by Mr. Mendenhall, is 3,760 feet.

On descending to Yukla-hitna River from Raven Creek our course led us down an easy slope of ground covered with spruce and birch. At the foot the valley opened broad and smooth, bordered with numerous parks and groves along its edge.

A magnificent glacier blocks the upper part of the valley, at a distance of 2 miles, rising to a height of several thousand

feet in 10 miles, and changes its direction to the right behind a ragged range of mountains. The contrast of green verdure close to this glittering mass of snow and ice is very pleasing.

For several miles the river bed, split into numerous channels fills the valley of Yukla-hitna, but is easily forded. The course of the stream is nearly northwest to the Knik Arm, the total distance being 33 miles.

This valley is one of great beauty, well timbered, and walled in at its upper extremity by bold and precipitous mountains that round off gradually into a low, flat country as the arm is approached.

Our provisions giving out prevented us from making a close observation of the country, especially as a dense smoke from forest fires hid the lower valley and surrounding hills.

There does not appear to be any material obstacles in the way of making a practicable trail or wagon route down this river. In order to reach the head of Knik Arm it would be advisable to leave the Yukla-hitna River at a point 6 or 8 miles above its mouth and skirt along the foothills. But this we were unable to do for reasons above stated.

I consider the route traversed from Portage Bay to the Knik Arm a practicable one. As to whether the heavy snowfall in winter in the divide will block travel for animals remains to be proven by actual trial, but should a trail once be established, and be kept open by travel, I believe it would be all right.

I was led to examine the route traversed, as well as other passes to the westward, by reason of the impracticability of the route via the head of Twenty-Mile River.

I wish to express my indebtedness to Mr. Mendenhall, of the United States Geological Survey, not only for his excellent sketches of Crow Creek and Yukla-hitna River, but also for his help generally, since it made it possible for me to finish this work.

Very respectfully,

LUTHER S. KELLY.

TYOONOK, ALASKA, *October 4, 1898.*

REPORT

OF

CAPTAIN W. R. ABERCROMBIE,

SECOND INFANTRY, U. S. A.

The originals of reports by Captain Abercrombie and his assistants not being accessible, the reports as here printed were taken from data compiled for publication of all explorations by military expeditions in Alaska.

REPORT OF CAPTAIN W. R. ABERCROMBIE,

ON

EXPLORATIONS IN ALASKA.

Crossing Puget Sound, the expedition which I had the honor to command arrived at Port Townsend on the morning of April 8, 1898. From this point two routes of travel diverge. One is known as the "inside passage," which follows up the straits and sounds between the mainland and Vancouver, Queen Charlotte, Prince of Wales, Admiralty, Baranof, and Chicagof islands, leaving the inland passage at Cross Sound. From thence it proceeds over the Fairweather Grounds, which lie south of Mount St. Elias and the Great Malaspinia Glacier and Kyak Island, striking Prince William Sound and Meiklejohn Entrance, so named in honor of Hon. G. D. Meiklejohn, Assistant Secretary of War.

After leaving Port Townsend the outside passage turns to the left and passes through the Straits of San Juan de Fuca to Cape Flattery, from which point a direct course is laid to Meiklejohn Entrance. The latter passage is usually taken by vessels taking full cargoes from port of clearance on the sound, and while much rougher than the inside passage, it is not so dangerous, being free from sunken rocks and other impediments that render the navigation of the inside passage dangerous in the extreme.

As the reindeer for the expedition were to be picked up at Haines Mission, near the head of Lynn Canal, the vessel kept the inside passage. The entire trip from Puget Sound to Haines Mission was in one continuous driving snowstorm, which at times forced the master of the vessel to anchor under the lee of some island in order to determine his position. Arriving at Haines Mission Tuesday, April 12, the starting point of the Dalton trail for the Yukon Valley, Captain Eldridge, Fourteenth Infantry, commanding Expedition No. 1, was found encamped on the beach. On consultation with this officer it was discovered that the reindeer herd from which the expedition was to receive its means of transportation was

so much debilitated as to be unavailable for that purpose. A quantity of subsistence stores which had been discharged by the bark *Seminole* a few weeks previous were found to have been exposed to the rain because of lack of canvas covering.

On April 13 an attempt was made to steam up to Dyea, 14 miles distant, but the expedition was compelled to return to its anchorage, as the steamer was unable to make any progress against the gale that had been blowing for the past twenty-four hours. Thursday, April 14, anchor was weighed for Dyea at 5.30 a. m., and at 8 a. m. the landing was made at that point. At the Fourteenth Infantry camp, located 5 or 6 miles up the gulch, application was made to Col. T. M. Anderson for 15 pack mules to be used by the expedition as transportation in lieu of reindeer. Owing to imperative orders from Gen. Nelson A. Miles, the application for pack mules was refused, as the mules had been ordered to be shipped to St. Louis, Mo. I thereupon returned to Haines Mission April 15, accompanied by Capt. E. F. Glenn, at 8 a. m., and proceeded with Captain Eldridge to Chilkat Inlet to see Mr. A. J. Kjellmann, who had charge of the reindeer train and attendants. Mr. Kjellmann reported that the reindeer were so weak that it would take at least three days to drive them into Haines Mission, and that in his opinion another sea voyage would kill every animal. It was therefore my judgment to return to the steamer and proceed to Port Valdez. Prince William Sound was reached on Sunday, April 17. Port Valdez was reached April 18 at 6 p. m. Here between 6 and 7 feet of snow were found on the level, which rendered the selection of a camp ground extremely difficult.

Returning to Valencia to make arrangements for the transfer of property pertaining to the expedition, it was learned that the quartermaster's department at Vancouver Barracks, Wash., had made no provision for the transfer of stores from the steamer to the shore. As current wages were offered and paid at the rate of $1 per hour, all that was left to do was to pack the entire outfit from a lighter beached at low-water mark to a point above high-water mark, through mud and snow, on the backs of the party, and make a cache. Considerable time was spent Tuesday, April 19, in sorting the stores belonging to Expeditions 2 and 3. These stores had been indiscriminately stowed in the hold of the vessel with some six hundred tons of miscellaneous freight belonging to

prospectors going into the Copper River district. An equable division of the stores in the hold of the steamer was made on April 20. Those for Expedition No. 3 left the ship's side in the steamer *Salmo* for Portage Bay, while those for Expedition No. 2 were transferred to the lighter *Thlinket*, which was lashed to the stern-wheel steamer *Wildcat*, to which had been transferred the stores of the prospectors. Both boats were beached some 300 yards below high-water mark, which was a snow-bank about 7 feet high, and from these boats freight was discharged as soon as the tide fell low enough to wade in with rubber boots and carry the packages ashore.

This was one of the most trying nights that the expedition was to experience during the explorations of 1898. The officers and men, not being used to the work they were called on to perform, were badly bruised about the shoulders and back. As the day was comparatively warm and the exercise violent, the clothing of the men became dampened, and in this condition they were forced to spread their blankets and sleeping bags on the snow by the cache without other covering and thus pass the night. The thermometer registered 8° below zero, but not a grumble was heard from any of the party, although at daylight the next morning some of the men were beating their frozen boots on the crust of the snow so as to get them in condition to pull on their feet.

Friday, April 22, was utilized in carrying supplies to Camp No. 1 from the cache until after the sun got warm and weakened the snow crust. The crust averaged from 3 to 8 inches thick and was capable of bearing from 100 to 2,000 pounds. On Saturday, April 23, First Lieut. P. G. Lowe, Eighteenth Infantry, topographical officer, was dispatched with Harvey Robe, a guide, on a side scout up Lowe River to look for and locate the old Russian trail into the Copper River Valley.

On April 26 First Lieut. Guy H. Preston, Ninth Cavalry, was outfitted for a scout over Bates Pass (so called in compliment to Maj. Gen. J. C. Bates, U. S. V.) into the Copper River Valley. Second Lieut. R. M. Brookfield, Second Infantry, topographical assistant, and F. C. Schrader, geologist of the expedition, were outfitted on the same day, with instructions to proceed over Bates Pass, sketching in the topography and noting the geological formation. On account of the continuous heavy snowfall, the scouting expeditions were compelled, April 30, to cache their outfits along the trails and

snowshoe back to camp, to allow the blizzard to blow over and the snow to crust. Monday, May 2, the snowstorm which started April 27, and continued without intermission up to that time, ceased and was followed by a rain of some five hours' duration. From April 27 to May 2 I estimate that some 6 feet of snow fell on the level.

From April 30 to May 2 snowslides kept up a constant roar. When the atmosphere cleared on the morning of May 2 the mountains presented a scarred and torn appearance, the result of the snowslides that had been heard during the storm. At 10 a. m. Lieutenants Preston and Brookfield, with Mr. Schrader, left for the summit of Bates Pass, Lieutenant Preston for the interior and Lieutenant Brookfield to sketch in the glacier and Bates Pass. A third party, under J. J. Rafferty, guide, was outfitted on May 3, with directions to proceed to the Bremner River country. On the following day, May 4, at 2 a. m., I left Camp No. 1 with additional stores for the Preston party. The trail was found in an excellent condition. Seven miles from camp Lieut. R. M. Brookfield was found on the glacier, snow-blind, and a man was detailed to lead him back to camp. Some 4 miles farther on the Preston and Rafferty parties were found camped on the fourth bench of the Valdez Glacier, in Bates Pass. C. F. Schrader, geologist, reports the summit of Bates Pass to be 4,800 feet in altitude, and estimated at the time that there were about 700 prospectors on the trail of the glacier between the foot and the summit. The Teznuna and Copper rivers on the following day were reported to be open. May 6 another party was started over Bates Pass, in charge of W. E. Goodman, jr., with additional supplies for the Rafferty party. The work incident to climbing the Valdez Glacier with sleds loaded with 100 to 150 pounds per man was now beginning to have a visible effect upon the members of the expedition, as well as the prospectors, in trying to penetrate the interior of that unknown region, the Copper River Valley.

An attempt to employ men to pack stores up to the summit of Corbin Pass (so named in compliment to Gen. H. C. Corbin, U. S. A.) proved a failure. A snowslide killed thirteen head of stock, and several men barely escaped death. Being without block and tackle, sledding on the steep ascents proved desperately hard work. As the men were beginning to fag out, I considered that I had taken every justifiable means to

penetrate the Coast range by man power. Private Tully having been taken sick at the summit, and a doctor having diagnosed his case typhoid fever, I directed that he be brought into camp on a sled. The reply came that if Tully was as sick as reported, to drag him 25 miles over the glacier in the present wretched condition of the trail would be tantamount to killing him. My rejoinder was that as he was lying in his sleeping bag in the snow, therefore the trip could not be more severe, and that all the necessary men should be detailed to bring him into camp. The mail steamer *Valencia* arrived from the south May 24. She was at once boarded to ascertain if any stock had been shipped up from headquarters Department of the Columbia for the use of the expedition. Finding no stock on board, nor any mail indicating that stock would be sent, I decided to go to Seattle in person as quartermaster of the expedition, where I could put myself in telegraphic communication with the authorities and get what was absolutely necessary for the success of the expedition, viz, pack animals for transportation. At Seattle I made formal application by letter and wire to the department commander, the General of the Army, and the Assistant Secretary of War for the necessary transportation to continue the explorations. The response that came to these applications was to purchase the necessary stock and ship them north.

Leaving Seattle and proceeding over the mountains to the North Yakima Reservation, two saddle horses and a guide were procured, as well as the required number of pack animals, pack saddles, etc. The latter part of June forty head of stock were shipped to Port Valdez. July 8 First Lieut. Guy H. Preston was by order relieved from duty with the expedition and ordered to join his regiment. The health of Lieut. R. M. Brookfield became so much impaired from exposure and overwork that it was deemed best to send him south, thus leaving but two officers with the expedition, viz, First Lieut. P. G. Lowe, Eighteenth Infantry, and myself. But as Lieutenant Lowe is a man to be killed but not conquered, no alarm was felt about the issue as long as he remained in good health. He was directed to organize a party, consisting of himself and three men, with ten head of stock, and to proceed at once to Forty-Mile River via Mentasta Pass, with a view to locating an all-American route from Valdez to the Yukon. He was given the pick of the expedition. Out of

the herd, which was by this time fairly well rested up from its long voyage, Lieutenant Lowe selected eleven head of the toughest and hardiest of the pack horses. After figuring the amount that each horse ought to carry, considering the character of the country, the boggy stretches and rapid streams to be crossed, the probable casualties from drowning and other causes, the outfit for his expedition was made as near complete as the material on hand would permit. I then looked over the ground, with a view to deciding how I would cross the Coast range of mountains. Two routes suggested themselves—one ran through the Keystone Pass and the other over the Valdez Glacier. The route by the Keystone Pass was abandoned, and the glacier was reported to be impassable for pack animals.

On consulting with Lieutenant Lowe it was decided that the course of duty lay over the glacier, even if all the stock and some of the men were lost in making the attempt. As it was a last resort, and utter failure stared the expedition in the face if the passage of the glacier was not successfully effected, I decided, after the return of the men sent over the Bates Pass with the Lowe expedition, to organize and equip a second expedition of four sections.

Section No. 1 was commanded by myself, its object being to cover as much as possible of that region embraced in what was known as the head of the Copper River district.

Section No. 2 was placed in charge of F. C. Schrader, geologist of the expedition, to explore and map the district embracing the Archer and Teikhell rivers, flowing into the Copper River from the west and heading in the Coast range of mountains back of Port Valdez.

Section No. 3 was placed in charge of Emil Mahlo, topographical assistant of the expedition, whose district embraced the Konsena and Tasnuna river valleys.

Section No. 4 was placed under the command of Corporal Robert Heiden, Fourteenth Infantry, whose orders were to cut and grade the trail up Lowe River and over Keystone Pass, thence to Thomson Pass (so named in compliment to Hon. Frank Thomson, of Pennsylvania), connecting with sections 2 and 3 on the head waters of the Tasnuna and Archer rivers.

This, it was considered, would practically take in all of the topography from the mouth of the Klutena River, about 180

miles above the mouth of the Copper, and 90 miles east from Port Valdez, a very rugged and mountainous district, to penetrate which to the Copper River Valley was the problem in hand. It was my purpose, prior to the departure of Lieutenant Lowe, to follow him through the Bates Pass, but on receipt of his report, stating as follows: "I do not consider the glacier feasible for animals from now until snow packs," I changed my plan and decided to cut trail with my entire force up Lowe River and go into the interior by Keystone Pass. With this end in view, the permanent camp at Valdez was abandoned July 18, with one packer and two horses to "prospect trail" up the Valdez Valley. Some 10 or 12 miles distant a number of very rapid glacial streams were crossed, and the main glacier stream was reached. Owing to the constant rain of some ten days previous, it was now a raging mountain torrent. Prospectors and others who had attempted to cross the stream prior to my arrival had failed; but as I had already forded a number of very ugly-looking streams, and as it was absolutely necessary to cross this one if I went in via Lowe River, I disregarded all advice in the matter and rode my horse into the stream with a view of swimming it if it was too deep to ford, believing that if my horse could carry my weight (215 pounds), the pack animals, that I intended to load with but 150 pounds, could also cross. When in midstream I heard the bowlders being washed down the river bottom and knew that I was in serious trouble. I pushed on some 5 or 10 yards with the water up to my horse's shoulder, when the animal was struck by one of these bowlders, carried off his feet, and washed some 150 yards downstream, rolling over and over in the torrent, while I clung to his mane with my right hand, covering my head with the left. While struggling to gain a footing, the animal struck me on the left hand and head with one of his fore feet, mashing some of the bones of my left hand. At about the same time the horse lodged against a large rock with his feet uppermost, with my body pinned under him. I let go of the mane and grabbed the animal by the tail, when, minus my blankets and outfit, the horse scrambled up the bank and pulled me up with him. The water registered 35 degrees, so that when I reached the bank I was unable to stand. Had it not been for the packer I would probably have been washed on down the stream and lodged in a drift pile.

Recognizing the fact that to bridge this stream and then cut trail for some 40 or 50 miles would take about the balance of available time for explorations left for the season of 1898, I returned to camp and made preparations for going on over Bates Pass. The following morning I found my entire left side to be black and blue and my left hand swollen to twice its normal size from the pounding I had received in trying to ford the Valdez glacial stream. Nevertheless, with Corporal Koehler and Private Bence, Fourteenth Infantry, I started for the camp established at the foot of the glacier by Lieutenant Lowe and began laying off a trail through the crevasses between the terminal moraine at the foot of the glacier and the top of the third bench. Private Bence was found to be particularly adapted to this work, and he was therefore appointed guide of the expedition over the glacier, with instructions to patrol the trail from the foot of the glacier to the third bench, building small stone monuments and noting from day to day the changes in the crevasses and snow arches. In the meantime Packer Lynch, who had formerly been a farrier in Troop B, Second Cavalry, was set at work sharp-shoeing pack animals. This was an extremely difficult job, owing to the fact that it was constantly raining, leaving the sod saturated and the ground in the vicinity of the field forge a series of miniature lakes. The ponies, having never been shod, fought desperately. Each horse in being shod had to be thrown.

Everything being in readiness July 27, the fog set in so dense it was decided not to attempt to cross the glacier until landmarks could be discerned. July 31 Private Garrett was sent up on the third bench of Valdez Glacier to bring in eight prospectors who had lost their way in attempting to cross Bates Pass. Some of these men had been on the glacier for five days, and during that interval had abandoned everything—guns, clothing, and food. The action of the fog seemed to be governed by the warm, moist air rushing in through Port Valdez from Prince William Sound, which, when striking the cold air blowing over the glacier through Bates Pass, rose rapidly and was precipitated as snow and sleet on the summit and rain in the valley below. There was rain and fog August 1, 2, 3, and 4, and the humidity was so pronounced and so continuous that bacon and ham became one mass of mold, while, the water of crystallization in the sugar being liberated,

the sugar wasted away in the form of a sirup. One thousand three hundred pounds of commissary stores at the camp in Valdez were exchanged for an equal amount in the interior, thus obviating the packing of this amount over the glacier.

August 5, notwithstanding the foggy, rainy weather, the expedition was ordered to proceed at once for the interior. Camp was broken at 5 a. m. At the foot of the glacier Private Bence was found, and when asked what he thought of the prospect of getting over the summit, replied that if the wind shifted and the pass was missed, that the stock and outfit stood a chance of being a total loss. On the arrival of the train at the foot of the glacier each section of it was inspected. Each section consisted of five horses, each horse being led by a man, and there was also an extra man and extra rope to each section. The instructions to the men were to proceed over the glacier at given intervals as a unit, and whenever a horse broke through a snow arch over a crevasse they were all to join at once in roping and pulling him out without unpacking. After seeing that everything was in its place, the train started, with Private Bence, with pickax and alpenstock, in the lead. I followed, leading my horse, on which I had packed a 5-gallon keg of whisky, to use as a stimulant during the night and the following day.

Passing onto the glacier, the animals seemed to know instinctively that there was danger ahead, as they would tremble and keep their noses close up to the backs of the men who were leading them. Whenever they broke through a snow arch, as they often did, they would lie perfectly still until roped. This applied equally to those which had been extremely shy and hard to approach prior to leaving the camp on the beach. As the expedition passed up through one crevasse, and turned to make an ascent of some 50 or 60 feet up a grade of not less than 45 degrees, onto the cone of a hogback that was obscured in the thick fog, some of the civilian employees were inclined to be a little weak-kneed, as it looked very much like climbing up the fog into space. But by a judicious use of the stimulant referred to, this was overcome, and, placing them along in the niches cut by Private Bence, we roped the entire train up with but few accidents. Now and then a horse would lose his footing and go down to the bottom with a rush. But as the trail was constructed so that all the attendants and packers were on the upper side of

the horses, nothing worse than bruises and cuts to the animals was the result of their falls. Never once did one of them refuse to climb out of an ice gulch when called upon, although many times they left a trail of blood behind them when the disintegrated rock of the moraine had cut them in their falls.

Arriving on top of the first bench, the fog was so dense that it was impossible to see more than five or six animals of a train at any one time. It was like a man groping his way in the dark, and at the end of two hours' traveling the expedition was completely lost. Every once in a while it was found that the melting ice had caused one of the stone monuments which had marked the trail to slide from its position. Then a halt would be called and Bence sent forward in the fog, just far enough to keep within hail. Having found the continuation of the line of monuments, he would call back and the train would move forward again. These were trying moments. In this way the train was kept moving during the day and well into the night, until 12 miles had been covered up the glacier. Here a bivouac was made for the night, as it was becoming so dark that one could not see to go farther in the rain that had been falling in torrents the greater part of the day. The picket line was stretched from one ice hummock to another, the pack animals tethered, and the cargoes removed from the pack saddles. As the rain was extremely cold, the saddles and blankets were left on the animals to protect them as much as possible. Their grain was portioned out on the ice.

To each man in the party a small tincupful of whisky was issued, some canned meat, cheese, and hard-tack. Some of the men pitched their shelter tents on the glacier and attempted to sleep; but in a few minutes they joined their comrades, who kept up a steady tramp all night backward and forward in rear of the picket line. I here take occasion to remark in this part of my narrative that during my twenty-two years of service on the frontier I never experienced a more desolate and miserable night. Not only was the night black, but the rain was continuous. Occasionally the mighty glacier would crack as it settled in its passage to the valley below, with a vibration that would cause the men to stop in their tramp and the horses to nicker with apprehension, if not fear. Then would follow a deafening roar as some thousands of tons of ice was detached from one of the

hundreds of glaciers that fringed the mountain sides. As these high fields of ice and snow would come crashing down onto the main glacier they would bound from wall to wall of the canyon, and the echo would die out finally down the valley many thousands of feet below. Like all other nights, this one came to an end. At daybreak another allowance of whisky was issued to the outfit, and the animals were packed and the party proceeded on its way toward the summit.

Four or five miles were covered, when a section of the glacier was encountered that was so bisected with crevasses of such width that for a while it was a question of getting through. But taking the train down a long narrow peninsula of badly crevassed ice, an outlet was found which could be doubled back on. The expedition was now in a position where it was as dangerous to go back as it was to go ahead. The mental strain on all at this stage of the journey was terrific. Progress was very slow; not more than a quarter of a mile an hour for the next three or four hours was made. Working in and out of this mass of crevasses we finally crossed what was known as the fourth bench, and found ourselves on better footing. Up to this point the glacier had been free from snow. A zone was now reached where the snow and slush were about knee deep, through which we plodded. Looking up toward the summit of the pass, the eye could not define where the sky line began and the snow ceased. In the middle of this zone, which was limited only by the range of vision, was a beautiful stream of clear water, with a deep blue bottom. It seemed in perspective, being so rapidly foreshortened by the fog, to be a blue column ascending into the sky. Following up the banks of the stream there suddenly flashed out through the fog the panorama of the fifth bench, which was composed of huge ice cliffs, through which the wind shrieked and moaned in a most weird and unearthly manner, at an extremely high rate of speed.

During all this time the march had been confined to the center of the glacier. A course to the right was now chosen, and we struck off for the mountain on the right of the pass, with a view of avoiding the fifth bench and striking the snowslides on the right-hand side of the pass. This is the point where so much stock was lost early in the season from avalanches. A number of snowslides were reached which were packed as hard as ice, and over which the expedition

traveled a number of miles, until the foot of the summit was reached.

This summit is where the glacier comes off the top of the mountain and is an abrupt descent of about 1,100 feet in the mile, or about one in five. The effort required to climb this pitch can be realized, in a measure, when it is understood that to make twenty yards of the ascent at once taxed the wind and energy of the strongest mountain climber. The four animals and five men ahead on the trail resembled small birds following each other as one looked at them far above in the fog. Halting at intervals of 5 or 10 yards, the summit was finally reached. The wind was blowing a hurricane through the pass into the interior, accompanied by gusts of sleet and snow, which, freezing as fast as they struck, coated men and beasts with an armor of ice. At this point, having a lighter load than the others, I found myself in the lead. I halted to wait for the rest of the party, but soon found that if I did not keep moving I would freeze. My horse also suffered severely from the cold. The wind was terrific. In vain I tried to catch some landmark to guide me in laying my course through the pass. If I made a mistake and left the pass by one of the feeders that came in from the higher peaks on each side, the remark of Private Bence of the day previous would be verified.

To stand still was impossible. The only thing left to do was to simply drift with the blizzard, and this I did. Fortunately for the expedition, the point at which the summit was reached was exactly in the middle of the pass, and whenever an attempt was made to veer either to the right or left from the true course of following through the pass the sleet cut the faces of the men so they would turn their backs to the storm and proceed in the proper direction. Had the wind blown into the pass from the right or left the expedition would have simply drifted out onto the great glacial fields. As the storm continued for several days, the men would have been snowed in, and probably the entire outfit frozen to death, as no living man could face the gale. But as luck was on the side of the expedition, it drifted through the pass and down toward the Klutena Valley.

After some five or six hours' travel in the howling storm, where it was impossible to hear or see a comrade, a high and rocky cliff was finally rounded and the expedition beheld the

most beautiful sight I ever witnessed. The change was almost magical. Two yards after passing behind the shelter of this rocky cliff there was a perfect haven of rest and sunshine, while out of the pass rushed the howling storm like the water out of the nozzle of a fire hose. Throwing ourselves on the snow in the sunshine, we stretched ourselves at full length and enioyed that rest which only men can who have been battling for their existence. As if understanding the situation, the poor, miserable-looking pack ponies, their manes and tails all clotted with ice, lay down in the soft snow and grunted with satisfaction as the rays of the sun peeled the coating of ice off their bodies. After resting here a short time and eating lunch, the expedition proceeded down the glacier to the timber line. Here camp was made for the night in a grove of stunted cottonwoods and willows. I had now successfully crossed the Valdez Glacier at a season of the year when it was universally conceded to be impassable for man, making the journey in twenty-nine consecutive hours of practically continuous work, without sleep, rest, or shelter. The command was, however, in bad shape. The men were more or less frost-bitten about the ears and hands, and the pack animals bruised and lacerated to such an extent as to render some of them unfit for service. After enjoying the luxury of the camp fire, and relating to each other our various narrow escapes, we rolled up in our sleeping bags and soon forgot the past in the sound and pleasant sleep that comes to the weary man in the field.

August 8 camp was broken early in the morning. The Heiden party and the civilians who had accompanied the expedition over the glacier returned to Valdez. The Klutena was crossed just below its source in the glacier. The expedition followed its right bank down some 4 miles to a grassy meadow behind a big, rocky bluff, locally known as "Twelve-Mile Camp." Here the shelter tents were pitched and blankets and clothing spread out to dry. After resting a day or two we pushed on down the valley toward Lake Abercrombie. Three or four smaller valleys open into this valley. At the head of each of these is a glacier, from which issues a stream of greater or less magnitude, depending on the sun's rays, which are exceedingly fierce on the glaciers and give a tremendous flow of water on the afternoons of clear days. Just above the head of Lake Abercrombie the streams unite

and empty into that lake through many channels. I here noticed that the climate in this region must be rapidly changing. I also noticed that in many places the moss was as dead and dry as punk, so that when a fire was started for camping purposes it was impossible to put it out. The small, dry roots of the moss would smolder for days and weeks, until a favorable opportunity would fan it into a blaze. I noticed there was quite a mound of petals under each spruce tree, the branches coming close to the ground. When a fire had eaten its way to one of these trees through the moss, the petals would ignite, and the fire, rushing up the tree with a roar, would create a flame 150 feet high. This would send forth a shower of sparks that would start thousands of additional fires, each to repeat the operations of the first. The entire valley seemed to be on fire, which made traveling through the timber very dangerous, as the falling trees were liable to injure man or beast if they did not stampede the entire pack train.

Camping at the head of the lake, I sent two men over to a place called "Rocky Point," with instructions to get the rations traded for while at Valdez. They were also, if possible, to hire a boat to transport the stores to the foot of the lake, a distance of some 30 miles. This would save the horses' backs, which were now very much swollen and badly scalded from the wet blankets while crossing the glacier; at the same time would give a minimum impediment while passing through the burning timber.

On August 11 the expedition passed through, in the vicinity of some small lakes, the finest redtop and bunch grass I had ever seen. The pasture was so tempting I decided to camp there for the day. The horses showed wonderful recuperative power, filling out rapidly. In many places the grass was up to their backs. Sending two of the men into the timber to locate a trail free from forest fires, I took an opposite direction and climbed a sharp, rocky point. Finding but one course, I left the next morning for the lake shore. Here we arrived after meeting with several interesting incidents from falling timber, fire, and smoke. Along the lake shore we passed several camps of prospectors. These all complained of lack of transportation and inability to get up into the mountains with enough food for successful prospecting. As a result, many of them were selling out

their outfits with a view of returning to their homes, cursing the Government for failing to build them a trail, as well as their own lack of foresight in not providing pack ponies to carry their supplies.

August 16 the foot of the lake was reached. Here was located one of the largest camps on the trail. The same conditions prevailed at this place. Here again the series of benches indicating the former existence of a lake is seen, the bed of which is now drained by the Copper and its tributaries.

On the following day the camp at the foot of Sunny Mountain was left and the expedition followed down the Klutena. From where it leaves the lake to its entrance into the Copper this stream is approximately 30 miles long. In this distance it has a fall of some 600 feet and is a series of rapids. Two of the most notable are named Devils Elbow and Hell Gate. A conservative estimate puts the loss to prospectors in attempting to line their boats down this stream at $20,000. Food of all kinds was strewn along the river banks and drift piles for miles in a damaged condition, but not completely spoiled. Arrived at Copper Center, the expedition separated with a view of carrying out the previously arranged plans. Two packers and myself crossed the Copper River, while Mr. Schrader with his outfit crossed the Klutena to cut trail down the Copper, exploring the Archer and Teikhell river valleys. August 23 I left the Copper River. Climbing a series of heavily timbered benches, with occasional openings covered with bunch-grass, I camped, late in the evening, at the foot of Mount Drum. Early the following morning I photographed Mount Drum and continued the journey over the plateau to a small lake 26 miles from Copper Center. Here a most excellent view may be had of the Copper River Valley. Looking to the west, the Coast range may be followed by the eye to the point where it loses itself in the Turnagain Arm. With an interval of several miles, occupied by the mouth of the Knik River, looking to the northwest, the sun's rays are seen reflected from Lake Taxlena. Beyond this lake, in the distance, were seen the snow-capped Rockies, in which the Sushitna rises. This range of mountains marks the northern boundary of the Copper River Valley. Turning slowly to the right, the trend of these mountains is followed. At this

point is noticed the contact formed by the Wrangell range, of which the towering Sanford, at the rear, is one. To the right, almost due east, is seen Mount Natalie, a spur of Mount Sanford. Between Mount Natalie and the range on which the camp was located was observed a valley, in which the Sanford River rushes and roars, although its abrupt banks hid it from sight.

Continuing our journey we crossed the Sanford, which in warm weather is a violent, turbulent stream, at times hard to ford. Climbing an abrupt gradient of 200 or 300 feet on the east bank, I found myself on a heavily timbered plateau with a gentle grade. We were now on the slope of Mount Sanford. It is a most beautiful country. At the upper end of the small lakes which here and there dot the landscape invariably hay meadows with the finest of redtop are found. Passing over this plateau, the expedition camped for the night a few miles from Boulder Creek. Here a photograph was taken of Mount Sanford, which bears about southwest from the camp. Early the following morning Boulder Creek was crossed. Here the rocky trail was left, and, climbing through the heavy growth of underbrush that lines the bluff, we attempted a bee-line for the mouth of the Slahna. The object was to verify the Indian reports that this country was filled with what was supposed to be an old lava overflow. After traveling some 15 or 20 miles, the report was found to be correct. A district was entered covered with lava slabs overlapping each other in the usual formation, and the entire mass covered with a thick growth of moss. Leaving the horses, a small butte was climbed, from which the glass revealed the continuance of the deposit up into the foothills of Mount Wrangell, to the south. Retracing our steps in a northerly direction, after the hardest of work cutting trail and helping the horses over the pitfalls in the lava field, we arrived on the banks of the Copper River, just above the mouth of the Slahna. Here an easy ford was found.

Getting well into the Slahna River Valley, the character of the entire country is changed. Pieces of rock containing mineral indications of various character were found in great quantity. Lower down, at the water level of the valley, were immense meadows of the finest redtop, which would make excellent hay. The Norway spruce, so abundant in the lower levels of the Copper River Valley, now gave way to a heavy

growth of white birch. Red currants and other berries were found growing in great profusion. The valley is a mile to a mile and a half wide. Continuing our journey up the valley I found, just above Lake Mentasta, what I deemed an available pass coming in from the west and Copper River Valley, with another near the head of the Slahna, which the Indians said was connected with Robertson River, which flows into the Tanana.

The abnormal consumption of provisions caused by the hard work, together with the loss of supplies from exposure to rain, now necessitated a return. Crossing the valley, crossing Mentasta Pass, the expedition followed up the east branch of the Tokio River. Near the head of this river I found three low divides. In order to locate the bearings camp was made while I ascended one of the highest peaks of the range. From this summit I had a very fair view of the surrounding mountains, being able to see distinctly the reflection from the water in the Tanana Valley. To the south and west the course of the Copper could be seen to the entrance of the Klutena. Underneath, to the right, lay a low pass into the Slahna Valley. I also saw another pass, in which heads an unknown stream. The Indians stated this was the most direct route to the Forty-Mile country.

Returning the next day to camp, I found on hand about 25 pounds of flour, 5 pounds of bacon, and a half pound of tea on which to feed two packers and myself back to the nearest settlement, which I estimated was 175 miles distant. Starting at once for the new pass, the Slahna River Valley was reached about 30 miles above its mouth. Finding that better progress could be made through the timber by stripping the horses, the outfit was placed on a raft. Being more familiar with boating than were the packers, I took charge of this craft while they started with the horses on a forced march down the river. By the time the mouth of the Slahna was reached the hard work was found to be telling severely on the horses. None of the parties of the expedition having traversed the Copper between the Slahna and the Klutena, I decided on the river route in preference to the trail to Copper Center by way of Mount Sanford. Some 10 or 12 miles down the Copper it was found the indistinct trail left the river and took off through some low flats. These flats are boggy, covered with individual tufts of grass in water and mud from 5 to 12 inches deep, making most fatiguing traveling.

During the second day's journey I met a man who claimed to have been sent north by a large cattle concern in the States to look for a trail by which to drive cattle into "Forty-Mile" and Dawson. This man stated he regarded the trail as perfectly feasible, as cattle would safely pass where a horse would mire down, and that he expected to drive in a small band of cattle in the spring from Valdez.

Crossing the Chestalena, which empties into the Copper through five or six different channels, the expedition continued down the river on the edge of the bluffs. Here the trail was fairly good for a man, but entirely too narrow for pack animals, which were continually striking their packs against the trees, tearing everything to pieces and bruising their backs. After crossing the Gakona one of the horses displayed alarming signs of weakness. After taking off his load and trying in vain to keep him moving, the poor brute was led into the river and shot. The saddle, blanket, and equipment were cached in an Indian balagan.

Arriving at the mouth of the Taxlena, the expedition found a settlement of some eight or ten cabins, also something to eat. Crossing the Taxlena, Copper Center was reached September 27. Here my intention was to turn up the Klutena River to Lake Abercrombie, from thence follow a low divide to the left, crossing over into the Archer River Valley, and from thence, by way of Thomson Pass, into the Lowe River Valley, to meet sections 2 and 3 at the head of Lowe River. However, the Indians stated that these "sections" had been wrecked on the Archer River, losing their outfit, and were now without food. Hence I abandoned the Archer River route to Valdez, and at once set about collecting food for sections 2 and 3. Hiring a boat from W. S. Amy, Copper Center was left September 28, and Taral, 75 miles distant, was reached at 6 p. m. September 29 Woods Canyon was shot and junction effected with the party of Mr. F. C. Schrader about 20 miles below, at the head of Bremner Basin. Mr. Schrader informed me that he had followed the Copper down to where the mountains of the Coast range and those of Mount Wrangell had formerly joined. He had ascertained that the gradient of the rivers given sections 2 and 3 to explore was so great as to render the task of cutting trail and bridging gulches beyond the strength of his small force of axmen. He reported that the Teikhell and the lower part of

the Konsena ran through a succession of canyons, and that he had been wrecked in the Archer, where one man was drowned. After this he had found it impossible to proceed with his pack train. The character of the timber through which they passed had entirely changed. Alders succeeded the Norway spruce. These alders reach a height of 12 to 15 feet, and grow extremely thick. Interlacing in many places, they form as impenetrable a mat as any equatorial jungle. Mr. Schrader's pack train was left with the Indian scouts at Taral, to be held until one of the employees of the expedition arrived, when they would be driven back to the winter camp. Proceeding down through the Bremner Basin with the entire outfit, I reorganized the expedition. Schrader and Mahlo were given provisions enough to last themselves and packers fifteen days. In that time I estimated they could reach Heiden Valley. This valley was so named in compliment to Corporal Robert Heiden, Fourteenth Infantry, the first to enter the valley. With such men as were not adapted to "back packing," I continued down the Copper in the boat. At the head of Abercrombie Rapids, just above Miles Glacier, the expedition camped to make a reconnoissance of the canyon. This was the point where, in 1884, I ineffectually spent two months attempting to get a boat up through the rapids. There has been a great change in the fifteen years elapsing between these two visits. The glacier is very much emaciated, and the channels through which the water rushes are much wider. The current, while less violent, is still of such a character as to preclude any thought of navigation under any condition. Shooting the first and second rapids successfully, the little party dropped down through the third and proceeded down the river past Childs Glacier. On the faces of both Childs and Miles glaciers I noticed a very marked change. Miles Glacier had receded toward Mount St. Elias some 5 or 6 miles. Where in 1884 the Copper washed the face of this glacier was now an immense lake. Childs Glacier had likewise receded, leaving a beach some 500 or 600 yards in breadth between it and the water, but adding a succession of very boisterous rapids.

Continuing the journey down through the Copper River Delta, the expedition camped at the old Indian village of Alaganik, passed out of the delta and up the Eyack River through Eyack Lake. A short portage was then made to salt water,

when Prince William Sound was followed along the shore; Cordova Bay, Ports Gravina and Fidalgo were crossed. On October 16 the expedition arrived at the camp at Port Valdez, having covered a little more than 800 miles afoot, on horseback, and by raft and boat since August 5.

I immediately dispatched my packers up through the Keystone Pass to Heiden Valley with rations for Schrader and Mahlo. I had been very much in doubt whether I would be able to make more than a mere reconnoisance over what I considered would be the main line of travel and "all-American route" from Prince William Sound to the Yukon River. Prior to my departure in August from Port Valdez I had reported these facts to the assistant adjutant general at Vancouver Barracks, Wash. One of the things that influenced me in making this report was the lateness of the season, as well as the great area over which the expedition would have to travel to explore the Copper River Valley and its tributaries. I therefore recommended that, to reap the benefits of the work and funds which had already been expended by the Department, the expedition be continued the following season. That no time might be lost, I had left instructions with a trusted employee of the Quartermaster's Department, Charles Brown, to open the reply to this report, and, if it was favorable, to immediately begin the construction of suitable storehouses and stables for a winter cantonment. On my return in October I found a long stable, 27 by 81 feet, with a storehouse and granary, that had been constructed by returning prospectors in return for aid given them.

I now considered the field work of 1898 about over, and proceeded to adjust my accounts as quartermaster and commissary of the expedition. The following day Corporal Kochler, with Privates Garrett and Gardner, Fourteenth Infantry, brought Mr. Mahlo, topographical assistant, to camp via the Copper River and Prince William Sound. Mr. Mahlo had been attacked by heart failure, resulting from overwork and exposure while back-packing up the Tasnuna River. I at once employed A. M. Powell, a mining engineer and mineral surveyor, to carry the line with his transit in from Port Valdez through the Keystone Pass to a point on the Tasnuna River where he should meet the Schrader party. I hoped by this means to close up the circuit so nearly completed before winter set in. The following day Corporal Heiden, Fourteenth

Infantry, in charge of the fourth section, reported the cutting and grading of the trail into the interior completed and a junction with the Schrader party effected. My pack train was immediately loaded with grain for the animals being driven in from Copper Center and sent up the Heiden Valley, where the grain was to be cached.

October 23 the Schrader party returned to Port Valdez, reporting that Mr. A. M. Powell had been caught in a snow-storm, which interfered with his triangulation, and would remain in the pass until it had blown over. He was then to complete his triangulation and forward his notes by the last steamer sailing south for Seattle, about December 10. This closed the field work of the expedition for the year 1898.

In conclusion, this narrative is necessarily crude, as it was written prior to the receipt of the photographic illustrations or the molding of the field notes of the topographers into map form. I call attention to the reports of Lieutenants Preston, Lowe, and Brookfield, Acting Hospital Steward John W. Cleave, Corporals Heiden and Koehler, and Guide Rafferty. I highly commend the energy displayed by these gentlemen in collecting information which will be of untold value in the settlement of this northern frontier.

I also acknowledge the uniform courtesy with which Capt. O. J. Humphrey, local manager of the Pacific Steam Whaling Company, treated all members of the expedition.

DRAINAGE OF THE COPPER RIVER VALLEY.

The Copper, or Etna, River is the main drainage of that valley, formerly the bed of an ancient lake, to the sea. The environment of the upper portion of this valley, which is formed by the main range of the Rocky Mountains splitting (a spur dropping off to the southwest, with the main chain keeping its general course with a gradual trend to the south, until it is finally submerged with the termination of the Alaska Peninsula), is a series of snow-capped sierras. The evidences of glaciation on the rugged faces of these mountains are everywhere present. While numerous glacier fields in active operation are met with, yet their emaciation is constant and very noticeable. The head of the valley is V-shaped in form, and, owing to the constant contributions of glacial silt in greater or less quantities by various glacial streams in

their flow to the center of the valley from the glacial field in the mountain, are constantly scattering the glacial detritus over the entire plain without confining the flow of water to any one channel. The depositing of this glacial silt on the roots of the willow and other shrubbery chokes them and destroys their growth, leaving acres of dead timber on the plain.

In the months of June, July, and August this plain, when seen with the reflection of the sun's light on the broad, shallow, glacial streams, presents the appearance of a mighty river. This condition prevails for a distance of some 30 miles to the west, where the Slahna enters the valley from the north. Here the slope of Mount Sanford from the south and that of the main range on the north join and dictate the natural course of the river bed, which still has many channels, although confined within a comparatively narrow area filled with numerous gravel beds. The current is noticeably swift, running probably 3½ to 5 miles an hour. The modern river is about flush with the banks at high water, while the ancient banks are arranged in a series of terraces. Here the course of the flow is almost due west. As the valley is followed down, the general trend is to the south, with a very slight increase in grade down to the mouth of the Chestalena. The river now becomes more serpentine, cutting the bank on the reverse curve. It here cuts out acres of the river bed in such manner as to leave the spruce trees lining the banks inclining at various angles over the current. Some of these are left in such position as to just clear the surface of the water. These are known to the boatmen as "sweepers," for the reason that in descending the river they are usually projecting into the main channel of the stream. In floating down the current the cargo of the craft is either scraped off or the boat upset when it meets one of these "sweepers," while in lining upstream the sweeper must be cut off. As the tree settles further, due to the erosion of the deposit under its roots, the top is caught by the swift current. It is then usually pulled out by the roots and lodged on the first sand bar as the nucleus for the formation of a drift pile. Through these drift piles the water rushes as through a sieve. This is another source of danger to boatmen which should be given a wide berth.

Passing the mouth of the Sanford, the swiftness of the current increases. The banks are much higher, rising almost to the dignity of cliffs. Passing the Gakona the river unites temporarily in one channel. The banks here are high, I should judge 400 to 500 feet in altitude, exhibiting the sedimentary stratification of the ancient lake bed in a very marked degree. Beginning at the top of the scarp is a deposit of 3 to 8 feet of black mold; under this usually comes 1 to 2 feet of quite coarse gravel. Then follows a very fine clay with an underlying gravel, another series of clay with a conglomerate, with indications of a precipitation of iron staining the strata. Another series of clay cliffs dip into the river. Between the Gakona and Tasnuna this uniform stratification continues, with the introduction of a sandstone and a marked increase of the iron precipitation. Immediately after leaving the Gakona the river takes a sharp shoot to the south, leaving a flat of many thousand acres on the northwest bank, covered with a dense growth of spruce. On the reverse curve the river scours the southeast bank, leaving a scarp of some 600 to 800 feet in altitude with a gradual curve to the northwest, and in a like manner scours that bank.

Here we meet with a very pretty exhibit of the mineral characteristics of the main Alaska, or Rocky Mountain, range to the north, and the Mount Wrangell series to the south, indicated by the precipitation in the stratification. Passing the Taxlena, the river again scours and cuts the right bank, which is a clay formation. The current has increased to possibly 6 miles an hour. Passing this cut bank, the river leaves its ancient bed and turns in the direction of Mount Sanford. The curvature of the modern river bed shows a deflection of some 5 or 6 miles from the old curve. Bowlders and reefs in the river would indicate the proximity of bed rock to the river bottom. This is strengthened by the notable decrease in the swiftness of the current and altitude of the river benches when the ancient and the modern are compared. Passing the mouth of the Klutena, the current is now probably at its maximum of some 6 to 7½ miles per hour. The flow is erratic, being a succession of pitches, a term used to indicate a stretch of the river where the water has worn the river bed out unevenly for a space of 800 or 1,000 yards. The current will drop to 4 or 5 miles an hour, when a drop or

increase in the gradient of some 100 or 200 yards brings the rate of speed of the current back to its maximum of 7½ miles an hour.

Below the mouth of the Klutena the Copper River Valley begins to narrow down. These conditions prevail to the mouth of the Chettyna, where it leaves the old lake bed and pierces the barrier formerly offered by the Coast range of mountains. This point is locally known as Woods Canyon, and is 2¾ miles long, 200 to 400 feet wide, inclosed by walls of green schist 200 to 400 feet high. There are many features of this canyon indicating erosion by falling water, similar to that at Niagara Falls, and again there are spots where the evidences of erosion are lacking. There is no danger whatever in the erosion of this canyon other than that incident to the eruptive flow of submerged undercurrents, which, during extreme high water, are boisterous in the extreme. The vibration of these noises, echoing back from the surrounding cliffs, led the Indians to believe that this section was inhabited by spirits, hence the extravagant stories. The river continues more or less confined to one channel, and hemmed in by high mountains on both sides, with a very marked reduction in the speed of the current to within the vicinity of the Bremner and Tasnuna rivers.

This section is known as Bremner Basin, and is formed by the intrusion of a very large glacier coming out of the Coast range of mountains from the west and cutting the river almost at right angles, forming a basin about 20 miles long and 5 wide. The river spreads out over this valley with its normal gradient, and the consequent diminution in the speed in the current, which has caused a precipitation of all matter of a sedimentary character borne by the stream as it entered the valley from Woods Canyon, thereby forming a partially submerged valley filled with quicksands and sandbars. Passing out at the lower end of this basin, the gradient is again increased as the river winds around the glacial obstruction, bringing the current up to its maximum. Leaving this large, unnamed glacier to the right, the river now butts up against Miles Glacier, which is here likewise covered with an immense amount of morainic matter and a dense growth of alders, which effectively protect the glacier proper from inroads by the river. Striking a high range of mountains, the environment of the valley to the west, the river is

again deflected south and enters the head of Abercrombie Canyon. This set of rapids has a canyon wall on the right side only. The left is formed by the encroachment of Miles Glacier, which cuts the valley just as the glacier at the foot of Bremner Basin does.

The left bank is the main mountain range. In this gorge are the rapids, or, as the prospector calls them, "pitches," formed apparently by rock reefs dipping into the river at almost right angles to its course. This gives the current a direct plunge, with a counter sheer from the right, as the banked-up water, striking this reef, is rolled back on top of the main current, as it were, many feet deep. Passing this reef, the water forms a series of whirlpools, which appear to move from one side of the river to the other, expanding and contracting. When two of these whirlpools, revolving in opposite directions, come in contact, the effect is startling. The water forms a cone some 6 or 8 feet high, with a terrific roar, and apparently bursts, beating the surface of the river into a startling mass. Some thousand yards below the first rapid a second reef enters the river, showing at low water a portion of its back in midstream.

In this rapid are encountered three forces, the direct plunge and the deflected currents from the right and left, forming a hollow some 6 or 8 feet deep, with a wall of water on each side. Like the first rapid, the second has a series of whirlpools below it for a distance of 500 yards, where the third rapid begins. This is a series of short "pitches" for a distance of possibly 700 yards, the water in places bounding up in the center of the channel from 12 to 15 feet. Below this rapid is a big, still eddy, some 800 yards in length and 300 yards in breadth. The greater part of the river, after passing through this slack water, turns abruptly to the left and plunges down a heavy gradient, and enters the lake or bay in front of Miles Glacier. These rapids are known, respectively, as the first, second, third, and fourth rapids. When I first visited this canyon, in 1884, there was but one rapid, the first. On my return this season the emaciation of the glacier was very marked. To the left of the second rapid the river had cut out the bowlders and worn a huge hole in the glacier, some 50 or 60 acres in area, which is the entering wedge for the formation of a new channel. The face of Miles Glacier, below the fourth rapid, has receded some 5 or 6 miles to the

east, or back from the river, and during the months of June, July, and August the falling of bergs cut out by the comparatively warm river water from this glacier keep up a continual roar, as they fall off, that can be heard for a distance of 20 or 30 miles. This débris blocks the river below with cakes of ice that scour out channels and form new courses.

At times the river here is completely blocked with floe ice, making miniature packs, opening and closing in much the same manner as in the Arctic seas. Passing the face of the glacier, which has also receded from the river some 500 to 600 yards, leaving some 200 or 300 yards of very nasty, rapid water, the river is deflected to the left by a mass of terminal moraine, and enters the Copper River Delta to spread out in a fan-like formation, and divides itself into thousands of little channels, interspersed with innumerable sand bars, which are covered with drift piles. During my explorations in this section of the country in 1884 this delta presented an entirely different appearance from that of to-day. Then the deposits were new and bright, the various channels more changeable, the process of "scouring out" and depositing more active. This I attribute to a more active discharge from Miles and Childs glaciers, with the consequent presence of a greater quantity of floating ice in the river, which kept the entire surface of the delta in a state of transition from sand bar to channel and from channel back to sand bar again. I think the channels are deeper in the upper part of the delta and the old ones shallower in the lower part. The bars at the mouth of the various channels appear to have formed themselver farther out into the ocean.

The amount of glacial silt annually brought down by this river must be enormous, as we have the phenomena of an ancient "bay," some thirty-odd miles broad and 37 long, entirely filled up with matter. This matter is ground so fine that the wind, which is constantly blowing in this delta, carries it like a bank of fog out over the ocean for a distance of 150 or 200 miles.

In conclusion, I would say that the main drainage channel of the Copper River is wholly unavailable as a means of transportation from the sea to the interior of Alaska.

SUBDRAINAGE OF THE COPPER RIVER VALLEY.

The Copper River, as known topographically, is a misnomer. This river is known to the natives as the Etna.

The Copper River proper is the eastern branch of the Etna, designated on the map as the Chettyna. In the language of the Stick Indians, who inhabit this section of the country, "chetty" means copper and "na" river. It will be observed that the final termination of all names of rivers is "na." I was informed by the Indians that the Copper does not rise in the Copper River Valley, but in the topographical valley of the Tanana, flows in a westerly direction, and passes through a canyon in the mountain range which divides the Tanana from the Copper River Valley.

Some 20 miles to the east of this canyon is the mouth of the Slahna, the first tributary of any importance emptying into the Copper. The Slahna rises in a broad, flat valley, some 50 miles north of where it empties into the Copper, and passes in a southerly direction down a narrow valley which apparently cuts through the main mountain range. It receives occasional contributions from glacial streams until it reaches the vicinity of Lake Mentasta, where a large, clear creek, starting in a lake over in the Copper River Valley, enters the Slahna through a low pass. From this point the grade of the river bed rapidly diminishes, while the valley widens out. This continues for about 3 miles, when the outlet of Lake Mentasta, a clear stream, empties into the Slahna. The latter river now becomes sluggish and serpentine, winding through a valley varying from 2 to 5 miles broad, dotted here and there with lakes of various sizes. Some 8 miles from its mouth a clear stream, the outlet of Lake Suslota, adds its tribute, while from the mountains on the west two more tributaries of clear water come in. Here the valleys of the Copper and Slahna merge in a broad plateau of glacial silt. About 5 miles east of the junction of the Slahna and Copper a glacial stream, flowing over a broad plain with many channels, enters the Copper. This stream drains the country in the vicinity of Mount Wrangell, and during the summer months carries a far greater volume of water than does the Copper at this point. This misled the prospectors, who followed it to its source under the belief that it was the Copper, only to find it an avenue of escape for the water from the immense melting glaciers, hundreds of square miles in extent, covering the northern slope of Mount Wrangell. During the winter season this stream ceases to flow.

Farther down the Copper, a glacial stream known as Boulder Creek enters from the south. This drains the district

between Mounts Wrangell and Sanford. This is a short, rapid stream, of no particular significance other than topographical features. Following down the stream three small creeks of no significance are passed, and the mouth of the Chestalena is crossed. Rising in the Rocky or Alaska range of mountains, this river flows in a southeast direction to its junction with the Copper. It has four large branches coming in from the north and one near its head from the southwest. Two of those coming in from the north are clear streams, the outlets of lakes; the others are all of glacial origin. While navigable for light-draft boats in the hands of experts, owing to its rapid current and shifting channels it can hardly be considered available as a means of transportation. Nearing its mouth the main channel divides itself into eight or ten small ones, and the river bed widens out into a delta some 5 or 6 miles broad.

The Copper River here makes a decided turn to the southward. Downstream some 12 or 15 miles is a stream coming in from the south, with channels and delta similar in character to that of the Chestalena. This is the Sanford, a short, rapid, glacial stream, the bed of which is filled with bowlders. It drains that section of the big bend embraced in the territory between Mounts Drum and Sanford. Its importance lies only in the dangerous ford at the crossing of the Millard trail, which in warm weather often delays the traveler.

Continuing on down the Copper, quite an extensive plateau is passed over. This terminates at the mouth of the Gakona. The latter river heads in the Alaska range of mountains to the west of the source of the Chestalena, and parallels it to the Copper. It may be navigated by small boats, but has a current like that of the Chestalena. Leaving the Gakona, a much smaller stream is passed, the Culkona, which has no known notable features. The next on the list is the Taxlena, which is the west branch of the Copper River. This stream heads in Lake Taxlena, some 45 miles to the westward of its junction with the Copper. I estimate the volume of water carried by it quite as large as that of the Copper at this point. Numerous glacial streams empty into Lake Taxlena, which is reported to be from 5 to 10 miles broad and about 25 miles long. The currents in the Taxlena preclude any sort of navigation. At points it is filled with bowlders; at all times it is a mad, dangerous stream, which can not be forded at any

season of the year, but must be swum in certain places where there are short stretches of smooth water.

Eight miles to the south is the Klutena, which is practically a duplicate of the Taxlena, but flowing in a northeasterly direction. The gradient of the river bed renders the risks incident to navigation prohibitive for commercial purposes. From the Klutena to the Chettyna, a distance of 64½ miles, are numerous streams of glacial origin, which may be classed as mountain torrents. The most important of these, on the right-hand bank, is the Tonsena, 39 miles from the mouth of the Klutena. Below the Tonsena is the eastern branch of the Copper River. This is the Chettyna, a comparatively short, violent, and unreliable stream, its rise and fall being very erratic. It drains the entire southern slope of the Wrangell series of mountains, which are literally covered with glaciers. The bed of this river is a succession of rapids and canyons. The left branch or Chettystone, which means, literally, "copper ore," heads up in the Scoloi Pass, and its sole principal tributary rises in the White River Mountains. This stream is called by the natives "Chettytoo," or "copper water." The left branch heads in the St. Elias alps, far to the southeast. It is much more sluggish than the Chettystone, and therefore is more accessible.

Passing the Indian village of Taral, which is located at the confluence of the Chettyna and the Copper, Woods Canyon is passed. The schist barrier of this mountain range no doubt separated the waters of a former inland sea to the north. This canyon being formed by erosion or convulsion, wearing or rending this barrier, the Copper River of to-day was formed. The character of the country through which the Copper River now flows has entirely changed. The river is closed in by high mountains and cliffs. The Teikhell, a glacial stream coming out of the mountains to the west, is a topographical feature only. Likewise the Konsena, which parallels it and empties into the Copper 101 miles below the Klutena.

Below the Konsena the character of the river bed again changes, spreading out into numerous channels and shifting sand bars. This is the head of Bremner Basin, which is formed by the partial closing of the Copper River Valley some 30 miles below this point. This is caused by the deposit of enormous masses of terminal moraine from the seacoast

glaciers which there fill the valley. Coming into this basin from the east is the Bremner River, a short and rapid glacial stream. This is a possible route over to the south branch of the Chettyna, by pack animals only.

Draining into the basin through numerous channels from the west is the Tasnuna, 117½ miles from the Klutena. The lower part of the Tasnuna is sluggish and navigable for boats of light draft. The upper portion of the river has cut through a portion of the mountain range, and is not available as a means of water transportation. However, this has a fairly good trail out to tide water on Prince William Sound; distance, 49 miles. From the mouth of the Tasnuna to the mouth of the Copper there are no streams in winter.

ECONOMIC GEOLOGY.

In the absence of the report of the geologist of the expedition, Mr. F. C. Schrader, United States Geological Survey, which has been delayed pending the assays now being made on specimens brought down by the expedition, I present herewith a simple summary.

On the coast in the vicinity of Prince William Sound we found mineralized zones rich in sulphides of iron and copper, notably at Port Dick, on the Kenai Peninsula; Latouche and Knights islands, in Prince William Sound, and at Copper Mountain, in Gladhough Bay. At most places the deposits are promising in copper, and at some places gold and silver have been assayed in paying quantities. In many places claims have been and in many others are being staked. At Gladhough Bay the ore vein is some 300 feet wide. The property has been bonded, and is being opened up by the Alaska Commercial Company. Should the mining industry develop to any great extent, it is probable that limestone for fluxing purposes can be found.

At some localities, in the supposed carboniferous rocks, the slates are so perfectly cleared and of such density and texture as to make a very good roofing slate; also suitable for other commercial purposes, and would doubtless be sought for in a country less favored with timber. It is not rare, as in Fidalgo Bay and on the point east of the entrance to Landlocked Bay, to find slate readily breaking into handsome thin sheets or plates three or four feet broad.

Placers have been reported at various localities, and I have been shown some very handsome coarse gold by a Mr. McClellan, who claims to have taken it out of the Copper River Valley. In all the tributaries to the Copper River I found fine or flour gold, in some instances as many as 200 well-defined colors to the pan of dirt. I have every reason to believe, and do believe, that very rich placer deposits will be found in the foothills of this valley. The great obstacle to the working of these placer diggings, however, is the thickness of the gravel deposit through which the miner must go to reach bed rock. On the Copper River, between the Chestalena and the Gakona, I saw evidences of what I believe to be large iron deposits. In the hands of the Indians I saw fragments of coal that was said to have been taken from the Gakona Valley. Mr. W. S. Amy, of Copper Center, shod the horses of Lieutenant Lowe's detachment, using coal taken from this district. In the Slahna Valley evidences of mineral deposits, indicated by float, was everywhere present. Ore containing free copper was found by me, and specimens are now in the hands of the Geological Survey being assayed.

Many claims have been staked out in the main Rocky Mountain range, concerning which another season will determine as to whether they are of sufficient value to warrant their development.

THE INDIANS OF THE COPPER RIVER VALLEY.

These Indians aggregate, all told, probably 300 souls. They have, by common consent or by conquest, divided the valley into various geographical districts, each band keeping to its own territory, while hunting and fishing, with great care, and resenting any intrusion on the part of a neighboring band, sometimes with force. It is not an uncommon thing, early in the season, for the Indians on one side of the river to go hungry for the reason that the salmon are running on the opposite side, which happens to be in the territory of a neighbor.

Their caches or balagans are never molested. When the spring thaw overtakes them they cache their toboggans and sleds without a thought of their being molested by anyone. Their houses are treated with the same respect.

THE TAXLENA INDIANS.

The strongest band in the valley are probably those living on the Taxlena Lake district, numbering in the neighborhood

of 150—bucks, squaws, and children. They are decidedly the finest specimens of Indians I have seen in Alaska. Their chief is known and respected from Mentasta Lake to Cooks Inlet. Their territorial lines range from the mouth of the Taxlena westward to the Knik River, and from the Taxlena eastward to the Colkuna, a small unnamed stream, and northward to the main Rocky Mountain range. This section is one of the choicest game ranges in the valley.

THE GAKONA INDIANS.

These Indians range in the Gakona and Chestalena River valleys, in all about 75 persons. They are probably the poorest Indians in the valley. Two families of this tribe live in the vicinity of Lake Mentasta. The Taxlenas and Gakonas are the remnant of what was known to the Russians as the Upper River Indians, or Colcharnies.

THE KLUTENA INDIANS.

Below the mouth of the Klutena we come into the district of a subchief by the name of Stickman, or Stickwan, who has a following of some 35 Indians. His district extends from the mouth of the Klutena to a small creek a few miles above the mouth of the Chettyna, and thence westward to the Coast range of mountains, taking in the Archer River Basin.

THE CHETTYNA INDIANS.

Adjoining the territory of Stickwan on the south is the country of the notorious Nikolai, chief of the Chettynas, whom the Russians in their palmiest days could not subjugate, owing to the rugged mountain canyons into which he could retire when they attempted to attack him. He and his people are accomplished hunters and fishermen.

Early in the season, while at Port Valdez, I employed a squaw by the name of Omelia to act as interpreter. She had been left on the Valdez Glacier during a blizzard by her people, who were on their way to the interior after having finished their fall trading, and who was rescued by some squaw men, with whom she lived for a number of years, thus learning in an imperfect manner the English language. With her assistance I did fairly well in collecting data from the Indians and in impressing upon them our good intentions in opening up their country, until, on the occasion of some celebration, this

squaw was for the first time in her life given some whisky, and, like some of her fairer sisters, being tempted, she listened to the tempter and fell to rise no more. From that day forth I was unable to control her when there was whisky in camp.

During the month of September I employed ten of the Copper River Indians as scouts, not with the idea that they would actually perform the duty of scouts, but with the idea simply of identifying them with the white people who were entering their country for the first time with a view to permanent location; and also, as an act of charity, I issued them clothing, as it was quite plain to the casual observer that the immigration of so many white people into the Copper River Valley meant the driving out of the greater part of the large game, on which they depend entirely for their supply of food and clothing during the winter. I also impressed on Stickman and Nikolai the fact that if they would come to the coast when their supply of food ran short in the winter they would be given rations, and, if necessary, clothing, provided they did not molest the white miners who were in the Copper River Valley.

GENERAL CHARACTER OF THESE INDIANS.

It will be found to be the universal verdict of all who have come in contact with the Copper River Indians that they are honest, inclined to be friendly, and temperate. During the last season it was no uncommon sight to see these Indians wading out into the river and rescuing the supplies of some miner whose boat had been wrecked farther upstream. Piling them up on shore, they would go 3 or 4 miles out of their way to notify the owner where he could find them. Of the taste of whisky they were totally ignorant, their strongest beverage being black tea.

What will be the fate of these poor Indians in the next two or three years it would be hard to forecast. Yet, while they are few in number, the topography of the country is such that should they resent the wrongs that naturally follow from the contact of the white man with the Indian, the little band of Nikolai's following on the Chettyna could in one season, if so disposed, retard the development of this section of Alaska (which has gone forward with such rapidity during the last year) for years to come.

In this connection I beg to recommend the employment of these Indians as scouts during the summer season, even though

they render no military service whatever, as I believe it would be a move in the interest of economy.

AGRICULTURAL RESOURCES OF THE COPPER RIVER DISTRICT.

The soils of this valley are largely of vegetable origin, and where the natural formation admits of anything like a reasonable drainage the ground is thawed out and dried to a considerable depth. This is more particularly the case where there is a southern exposure. The depth of the soil varies from 3 to 8 feet. In selecting soil for agricultural purposes, in addition to the grade of the slope there must be taken into consideration the underlying strata. If these are of glacial clay, impervious to seepage of water, the foundation for the top soil will be cold and soggy; the sun will be unable to warm the top soil, and the results will be unsatisfactory. If land having the proper surface drainage and with a stratum of gravel underneath is chosen, the subdrainage will carry off the surplus water, the sun will warm the top soil, and plant life will thrive. I believe the possibilities of the development of an agricultural industry in the Copper River Valley to be conditional only on a market for the product of the small farmer. I embody the report of Mr. Jacob Sittell, a landscape gardener, who formerly resided in Portland, Oreg., as follows:

COPPER CENTER, *August 30, 1898.*

I reached Copper Center about June 4 and started in on a little garden. By July I had three kinds of lettuce and radishes big enough to eat, and now, the last of August, have onions, peas, beets, carrots, and turnips ready for the table. I could find a ready market for them, but shall keep them for my own use as a precaution against scurvy. If it does not freeze before October, I shall have cabbage, German kohl, corn, and beans. I did not plant any potatoes, as I did not have any seed, but I have seen some very fine new potatoes here, and I think if a man took time and trouble he could raise anything in the line of vegetables. If I could have started my garden by the last of April I would have had a fine showing by now; even as it is I have nothing to complain of.

There are two kinds of wild currants here—the red, *Ribes rubrum*, and black, *R. laciflorum*. The former are very plentiful, and you could not tell them from tame currants; they are as large and fine. In places a man can pick 10 gallons in a day. The black are not so plentiful; they are sweet, and the bears are fond of them. Then there is the dewberry, *Rubus chamæmorus*. The plant, seed, and blossom resemble the strawberry, but there is but one berry to each plant, though that is large and fine. One finds this berry in swamps. There is a kind of moss, *Empetrum nigrum*, that has a black berry—crowberry—which resembles the

wild cherry in size; but the berry is much sweeter than the cherry, and the frost does not seem to affect them, for I found them when I came, and they had stood the winter all right. We also have the blueberry, *Vaccinium uliginosum*, which grows on a small plant 10 inches high and mostly in swamps. They have a fine flavor and make good pies. There are any number of cranberries, *Vaccinium vitis idæa*, some of them of great size. We have, too, a red berry about the size of a currant, probably *Viburnum panciflorum*, which is very bitter and grows on bushes 2 feet high. I asked an Indian the name of them, and he said "bear-eat-em-berry." There are other berries here that I do not know the names of, but, as a rule, they are good to eat.

There are two kinds of wild roses here, the dark-red, which is like the jacqueminot, and the lighter red, like the La France. The dark one is in full bloom about the first of July, but the petals soon drop off, when an apple forms about 1 inch long by ⅝ inch through. It has very large seeds and its taste is like that of the pear. This same description will apply to the light-red rose. There is a handsome bright blue flower, *Lysenius nootcatensis*, which resembles the Laffgoba, or German stocks. The leaves are like the clove leaf, only a little longer, and are seven in number. They are in bloom about three months of the year. We have a beautiful yellow marguerite, probably a species of arnica, whose bloom is as large as a half dollar and the leaf about 4 inches long by 1 wide. There is also the red, white, and pink pioneer de flaks—fire weed—*Ipilobrium angustifolium*, that springs up after the moss and underbrush have been burned away and grows to a height of 2½ or 3 feet, and are covered with flowers from top to bottom, and there are acres and acres of them. We have Myosotes, and blue and white violets, and one can find twenty-five varieties of flowers, such as bluebells, white begonias, lilies, etc., in bloom at the same time. There is a flower like the crocus, but larger, the stem resembling that of the tulip, only seedling; in color blue and white. They peep up as soon as the snow disappears and in three or four weeks there are leaves several times as large as the clover leaf. The handsomest plant of all is a white azalia, that grows in about 2 feet of moss, to the height of 2 feet, covered with blossoms from top to bottom.

Opposite the mouth of the Sanford River Mr. Nelse Johnston and Mr. J. A. Otterness planted a garden on the 3d day of June with peas, turnips, radishes, onions, and lettuce. These men arrived there late in May, and, having only hand sleds for transportation, decided to build a cabin and wait for the following winter. I passed their cabin September 27, and in their garden measured turnips 4 inches across, found peas well podded, with lettuce and onions too old to be used. Mr. Johnston, who was formerly a small farmer in Minnesota, assured me there were thousands of acres of land covering the well-drained slopes of Mounts Sandford and Drum that would certainly raise wheat, the conditions being about the same as those met with in northern Dakota and Minnesota.

I saw along the trail, where scattering grains of oats and other cereals had fallen from the packs of horses, spears of those grains 3 or 4 feet high. The heads of these appeared to be fairly well filled out.

I also noticed where the fire had burned out the undergrowth that invariably a species of bunch-grass would spring up. I was told by the Indians that the first season after the ground was burnt over the "fire weed" sprang up, followed the next season by the bunch-grass. While not vouching for the truth of this last statement, there are thousands and thousands of acres of the finest kind of bunch-grass in the Copper River Valley. This was always eagerly sought for by the animals of the pack train, and they would pick out that growing on soil having the best drainage, although it was not always the rankest growth.

TIMBER FOUND IN THE COPPER RIVER VALLEY.

The timber found in the Copper River Valley embraces the spruce, fir, hemlock, cottonwood, birch, alder, poplar, willow, sagebrush, and greasewood.

On the coast, above an altitude of 800 feet, is found a dense growth of alder. Where the soil is favorable there are found, lower down, cottonwood and Sitka spruce, with some scattering hemlock and cedar. Sitka spruce grows to a very large size here, reaching, I should think, a height of considerably over 100 feet, with large, powerful branches. It burns equally well green or dry, and is the best fuel for heating purposes found on the coast. The cottonwood grows in groves on the coast, and is soft and sappy at all times of the year, hence of little value for firewood. In the interior, beyond the rain belt, the alder does not thrive so well. Here is found, in addition to the timber of the coast, Norway spruce, birch, poplar, sagebrush, and greasewood. The Norway spruce, though not so large in diameter as the Sitka spruce, is very valuable as spar, mining, and railroad timber. It averages from 12 to 18 inches in diameter and some 75 to 80 feet in height. The growth is so thick that it is practically impossible to take a pack horse through it without cutting a trail. On the dry ridges in the vicinity of the Slahna River the white birch comes in to the exclusion of almost all other timber. It will average about 14 inches in diameter. There are some very large trees, however, found in sheltered

places. The cottonwood is found in low, wet places, and does not attain the great size it reaches on the coast.

Forest fires have destroyed thousands of acres of this timber. They were originally started by the Indians to burn out the dense undergrowth, which enabled them to see the large game while hunting as it passed over these burnt districts. During the last season many of these fires have been started by careless campers, who would abandon a camp leaving their fire smoldering in the dry moss. Fanned into a blaze by the first breeze, the fire would reach the edge of the timber. Here the branches usually grow close to the ground and deposit a little mound of petals of a highly inflammable nature, owing to the large percentage of resinous matter. The fire once reaching the timber, it would, in consequence, leap up the tree with lightning rapidity, throwing cinders a distance of some 300 or 400 yards. During the latter part of August the smoke was so dense in the valley that I was unable to see across it, a distance of some 45 miles. A forester in this section of Alaska could do much to suppress this wholesale destruction of valuable timber by thoughtless natives and miners.

INSECTS FOUND IN THE COPPER RIVER DISTRICT.

Insect life begins early in May, when butterflies and other winged creatures are observed flying over the surface of the melting snow. The sun at this season is very fierce and strong for about ten hours each day, hatching out the larvæ that were deposited under the broken rocks on the mountain side during the previous season.

Insect life is at its height late in June and early in July, when the mosquito is met in swarms. I have seen men, who had either lost or failed to provide themselves with head nets, scream with pain and fright when passing through a swale of high grass. The insects, rising in clouds, would crawl into their eyes, mouth, and nose, almost smothering them. I have also seen the same conditions at Fort Buford and other points on the Missouri River, so that I do not regard such an incident as peculiar to Alaska. It is generally believed that these insects begin to breed with rising water. I noticed, on the contrary, that the first flight is just after the water begins to fall. At that time the humid conditions are favorable to their propagation. During June and July one must expect

to meet these pests in hordes when traveling in the low, wet grounds of the valleys. By climbing a mountain and pitching a tent upon a high rocky point one may escape them almost entirely. During the insect season all large game take to the mountains and do not come down until the season has passed.

The following is an imperfect list of the insects noted along the trail by this expedition: The bumblebee, honeybee, wasp, moose fly, yellow fly, mosquito, gnat (small black and sand), ants, caterpillars, butterflies, spiders, grasshoppers, moths, and millers.

FISH FOUND IN STREAMS EMPTYING INTO THE COPPER RIVER.

The fish incident to the streams tributary to the Copper River include all the salmon family, with the grayling. I refrain from entering into details, as the subject has been exhaustively treated. However, clear, bright water is not necessary for the propagation of the trout, grayling, and salmon. I found them in small lakes and streams stained almost black from moss or trees.

The salmon is one of the chief articles of food of the natives. The first run gets up the river along in the early part of July. This is the humpback and dog salmon, followed later on by the red salmon, which may be found in the clear-water tributaries as late as September 15.

BIRDS FOUND IN THE COPPER RIVER VALLEY.

Horned grebe—*Colymbus auritus.*
Loon—*Gavia imber.*
Black-throated loon—*Gavia arcticus.*
Red-throated loon—*Gavia lumme.*
Herring gull—*Larus argentatus smithsonianus.*
Arctic tern—*Sterna paradisæa.*
Red-breasted merganser—*Merganser serrator.*
Mallard—*Anas boschas.*
Green-winged teal—*Nettion carolinensis.*
Blue-winged teal—*Querquedula discors.*
Canvasback—*Aythya vallisneria.*
Scaup duck—*Aythya marila nearctica.*
Golden-eye—*Clangula clangula americana.*
American scoter—*Oidemia americana.*

Little brown crane—*Crus canadensis.*
Wilson's snipe—*Gallinago delicata.*
Field plover—*Bartramia longicauda.*
Spotted sandpiper—*Actitis macularia.*
Canada grouse—*Canachites canadensis.*
Willow ptarmigan—*Lagopus lagopus.*
Rock ptarmigan—*Lagopus rupestris.*
Marsh hawk—*Circus hudsonius.*
Sharp-shinned hawk—*Accipiter velox.*
Golden eagle—*Aquila chrysætos.*
Alaskan bald eagle—*Haliætus leucocephalous alascanus.*
Osprey—*Pandion haliætus carolinensis.*
Hawk owl—*Surnia ulula caparoch.*
Kingfisher—*Ceryle alcyon.*
Alaskan three-toed woodpecker—*Picoides americanus alascensis.*
Flicker—*Colaptes aurates.*
Rufous hummingbird—*Selasphorus rufus.*
Alaska jay—*Perisoreus canadensis fumifrons.*
Northern raven—*Corvus corax principalis.*
Rusty grackle—*Scolecophagus ferrugineus.*
Alaska pine grosbeak—*Pinicola enucleator alascensis.*
Crossbill—*Loxia curvirostra minor.*
White-winged crossbill—*Loxia leucoptera.*
Common redpoll—*Acanthis linaria.*
Hoary redpoll—*Acanthis hornemannii exilipes.*
Snow bunting—*Passarina nivalis.*
Alaska longspur—*Calcarius lapponicus alascensis.*
Gambel's sparrow—*Zonotrichia leucophrys gambeli.*
Western tree sparrow—*Spizella monticola ochracea.*
Slate-colored junco—*Junco hyemalis.*
Lincoln's sparrow—*Melospiza lincolni.*
Cliff swallow—*Petrochelidon lunifrons.*
White-bellied swallow—*Tachycinetta bicolor.*
Waxwing—*Ampelis garrulus.*
Butcher-bird—*Lanius borealis.*
Yellow-rumped warbler—*Dendroica coronata.*
Golden-crowned thrush—*Seiurus aurocapillus.*
Water thrush—*Seiurus noveboracensis.*
Chickadee—*Parus atricapillus septentrionalis.*
Gray-cheeked thrush—*Turdus alicia.*
Dwarf thrush—*Turdus aonalaschkee.*

Robin—*Merula migratoria.*
Varied thrush—*Hesperocichla nævia.*

MAMMALS FOUND IN COPPER RIVER VALLEY.

Moose—*Alces americanus* Jardine.
Caribou—*Rangifer caribou* (Gmelin).
Mountain sheep, bighorn—*Ovis dalli* (Nelson).
Mountain goat—*Oreamnos montanus* (Ord).
Great brown bear—*Ursus* (*dalli* Merriam)?
Brown bear—*Ursus* (Spec.?).
Black bear—*Ursus americanus* Gmelin.
Silver-tip bear—*Ursus horribilis alascensis* Merr.
Blue glacier bear—*Ursus emmonsi* Dall.
Yellow bear—*Ursus* (Spec.?).
Black or silver fox—*Vulpes pennsylvanicus* (Boddaert).
Arctic fox—*Vulpes lagopus* (Linn.).
Beaver—*Castor canadensis* Kuhl.
Marten—*Mustela* (Spec.?).
Mink—*Lutreola* (Spec.?).
Muskrat—*Fiber zibethicus* (Gmelin).
Whistling marmot—*Arctomys caligatus* Eschscholtz.
Porcupine—*Erethizon* (Spec.?).
Gopher, or ground squirrel—*Spermophilus erythrogluteius* (Richardson).

RAILROAD ROUTES AND ROUTES OF TRAVEL FROM PORT VALDEZ TO THE TANANA AND FORTY-MILE DISTRICTS IN ALASKA.

The map of Alaska shows only two lines of travel into that section of the interior, both confined to the main artery of drainage, the Yukon River. The southern route from Seattle to the Klondike, or Dawson City, is by rail from Skagway, at the head of Lynn Canal, over the White Pass to the head waters of the Yukon, which rise in a series of lakes in a flat, marshy country. Through this region the construction of a railroad will be a difficult problem. At present prospectors take a line of steamers at these lakes, passing through them into Lewis River; thence down to the junction of the Lewis and Pelly rivers, where originates the Yukon. Going down the Yukon, the Klondike region is entered and Dawson City is reached, at a distance of about 575 miles from the

coast. As a means of water transportation this route is available for only about four months of the year. The northern route from Seattle is entirely by water, and from St. Michaels, at the mouth of the Yukon, follows that stream in a northeasterly direction to Fort Yukon. Here, at the mouth of the Porcupine River, it turns and follows a southeasterly course to Dawson City.

With Skagway at the head of the Lynn Canal, Fort Yukon at the mouth of the Porcupine, and St. Michaels at the mouth of the Yukon, it will be observed that this river forms the arc of a circle. Of this arc Port Valdez, on Prince William Sound, is the axis. To put it more plainly, consider the arc of the circle as a portion of the felly of a wheel, with Port Valdez as the hub. Strange as it may appear, in making this great curve the Yukon parallels almost the trend of the coast line at a distance of some 500 miles from the sea.

Comparing the mileage between St. Michaels and Dawson City, which is 1,600 miles, and that from Skagway to Dawson City, which is 575 miles, we find the Skagway route to be 1,025 miles the shorter. Comparing the distance from Skagway to Dawson City, 575 miles, with that from Port Valdez to Dawson City, 400 miles, we find the difference to be 175 miles in favor of the Valdez route. It is apparent from these figures there are but two routes of communication to be considered, the Skagway and Valdez routes. Disregarding the fact that the Skagway route passes through foreign territory and and involves taxation, with the usual formalities, it will be found that, topographically, the Lynn Canal and Port Valdez are about the same, with a difference in elevation of the White Pass on the Skagway route and the Thomson Pass on the Valdez route of something like 1,000 feet in favor of the Thomson Pass. The meteorological conditions are about the same.

I think there can be no comparison of the agricultural possibilities. I am profoundly of the opinion that the Copper River Valley will produce all the cereals, garden truck, small fruits, etc., that will be required by the mining population which may hereafter inhabit the Copper River, Tanana, and Forty-Mile districts of Alaska.

The gradient into the interior for railroad construction is practically nominal. Bridge timber, timber for railroad ties, coal, and iron, I believe, will be found in abundance. I did not understand that I was directed to make a preliminary re-

port on the route for a railroad, but simply to report whethe the topographical features of the terrain are such as to rende the construction of a road practicable. Not only do I regar it possible, but believe it to be a commercial proposition o great merit. All the natural routes (gradients considered) are confined to the Keystone Pass at starting for passag through the Coast range of mountains. Having passed thi range to a point in rear of Corbin Pass, there are three pos sible routes. These are up Lowe River, through the Keystone Pass, to the head waters of the Tasnuna, thence down that river to its junction with the Copper, a distance of 49 miles from tide water; second, up the Heiden Valley to the Konsena divide, down the Konsena to its junction with the Copper, 93 miles from tide water, and, third, up the Heiden Valley and over the Thomson Pass, thence into the Copper River Valley.

Having reached the Copper River Valley, it is possible to proceed in any direction, the deposits of iron and coal dictating the course of the preliminary line.

SITES FOR MILITARY POSTS AND OUTLYING STATIONS.

The abrupt environment of the topography of Port Valdez leaves but one site which I could recommend for consideration as a military reservation. It is located on the south side of Port Valdez, some 6 miles from the head of the bay. Here there is a small plateau containing some 800 acres of land. The overhanging cliffs inclose what is locally known as Solomons Basin, at the head of which is a large glacier. The stream from this glacier would afford an abundance of water for the garrison. An abundance of spruce wood grows on the mountain side. One of the principal attractions of this place is the anchorage, the beach being shelving, yet not so abrupt as to preclude good holding ground.

As a second choice I report upon, but do not recommend, the site chosen in 1898 for my permanent camp. At first this would impress the visitor as the best location, as there is a broad plateau, some 6 or 8 miles broad and 3 miles deep, which presents a gentle gradient of about 200 feet to the mile, in full view. Cottonwood timber is plentiful. An unobstructed view of 5 or 6 miles of trail can be had. These are all of its recommendations. The objectionable features are the great depth of water and the absence of holding ground for the anchorage of shipping. The prevailing wind is up or down

bay. During the summers the entire plain is flooded with glacial streams. This permanent camp was used by me as the base from which to compute all distances in the interior.

Passing the Keystone Pass, I suggest the location of a relay station at the foot of Thomson Pass, about a day's drive, 20 miles, from Valdez, at the eastern end of Corbin Pass.

Crossing over Thomson Pass, down the Archer River Valley, over the Quartz Creek Divide, and down that stream to the point where the Klutena leaves Lake Abercrombie, I recommend the location of a substation. From such a substation assistance can be rendered prospectors in the Klutena Valley and to those operating in the Archer River Valley. Here there are hay meadows and ground susceptible of cultivation.

Following the Klutena to its mouth and crossing the Copper is found the third point recommended by me for a substation. This is the intermediate point between the Indians from Lake Taxlena and those on the Copper, between whom there has been friction in the past. It is also the point of departure for those crossing the big bend of the Copper, and forms a supply point for the relay stations farther to the west. Twenty miles farther on, in the plateau of the big bend of the Copper, is found a valley and a lake. Fuel, grass, and shelter from the storm recommend this as a place for a relay station.

Crossing the plateau of Mount Sanford, a point in the Boulder Creek Valley is reached, from which point is exhibited the character of this plateau, with Mount Sanford in the distance. Here I think a relay station should be located.

The natural site for the upper substation in the Copper River Valley is found under a high gravel bank on the west side of the Slahna, at its junction with the Copper. This is reached by crossing Boulder Creek and passing thence to the ford on the Copper just above the mouth of the Slahna. Here all the requisites of wood, water, and grass may be had in abundance.

The last substation I recommend is reached by passing up the Slahna to Mentasta Pass. Here fuel and forage may be gathered in summer for winter use. I also recommend the establishment of a military telephone line to connect this system of stations.

At each substation I suggest the stationing of four enlisted men, two Indian scouts, and a noncommissioned officer, supplied with four pack ponies, a supply of relief stores, and the

latest maps of the region. The relay stations, I think, should be garrisoned by two enlisted men and one Indian scout, with two pack ponies, supplies, and maps. This system of relay stations, in my opinion, would eliminate the sensational stories which, owing to the lack of reliable information from the interior, are now eagerly sought for and published. It is a modification of the system of one-company posts pursued in former years during the settlement of Colorado, Montana, Dakota, and the other Western States.

For this duty only picked men should be detailed, who are naturally fond of frontier service. I also call attention to the methods employed by the Mounted Police of the Northwest Territory in their enlistments.

THE COPPER RIVER MINING EXCITEMENT OF 1898.

My first information of the auriferous deposits in the Yukon Valley was obtained from the Sheflin brothers, who, having been made wealthy by the discovery of valuable mining property in the Tombstone district, Ariz., decided to gratify that fever ever present in the brain of a successful prospector, to find some "new camp," and explore the Yukon Valley in Alaska. They proceeded to St. Michaels, at the mouth of the Yukon, with a little stern-wheel steamer in sections. Putting together their boat, the *New Racket*, they set out in the spring of 1883, with a two years' supply of everything money could buy, and proceeded up the Yukon to the mouth of the Stewart, where they found their first pay dirt of any value.

The following year I was sent to Prince William Sound to find a trail somewhere in the vicinity of the Copper River, which had been reported by Russians as leading into the interior. On returning from this duty in the winter of 1884, I met a prospector by the name of McKonkey, who had spent the previous winter in prospecting the Yukon River. From this man I gained the impression that flour gold existed from the mouth of the Tanana to the lakes at the head of the Yukon. Owing to the shortness of the seasons, the crude means of transportation, and the ordinary means of placer mining being inadequate, there had been no paying discoveries made. From year to year these reports came from the Yukon Valley with perplexing variations. While the professional miner was satisfied that placer deposits existed in the Yukon Valley, he was skeptical about advising the enormous investment necessary to successful work so far from the base of

supplies. These fluctuating reports kept the mining world in a feverish condition. This condition was enhanced by the dying out of the excitement regarding the discoveries in South Africa and Australia. Hence, when the reports became verified by the shipment of gold dust, of a character peculiar to a new district, to the branch mint at Helena and to other mining centers, the mining fever became epidemic. The characters and conditions existing in California in the early fifties and in Montana in the late sixties were simply transferred to a more northern zone. Seattle, Dyea, and the Klondike were the three magic words which might be heard from morning until night. Steamers were crowded with fortune hunters, mail facilities congested, and the greater the confusion the more intense became the excitement. The prospector with $1,000 in gold dust upon his return to Seattle or San Francisco was amazed to find his name in the headlines of the newspapers, in which was announced the arrival of a Klondike millionaire.

Coming after years of stagnation in legitimate business pursuits, these announcements induced thousands to invest the savings of years. Cooperative syndicates were formed through which these investors sought to secure their share of the glittering gold they believed to be strewn along the river valleys of Alaska like pebbles on the shore of the ocean. Many of them crossed the Mississippi for the first time in their lives and were wholly unacquainted with the customs and methods prevailing in the sparsely settled Western States. The first obstacle these adventurers encountered was the rules and regulations provided by the Mounted Police of the Northwest Territory of Canada for the collection of duties, etc. Written accounts were sent back containing garbled accounts of these regulations, so that the friends at home considered the prospectors were being gulled by dishonest officials in a foreign country. As a matter of fact, a finer body of men never graced a uniform than these same mounted police.

Following on the heels of these reports came the more sensational one of starvation at Dawson and Circle City. Now began to be heard mentioned an "all-American route," over which a citizen of the United States could travel without paying tribute to a foreign nation. All available literature bearing on the routes of travel into the interior of Alaska over American territory were eagerly sought for. Of the

many guidebooks placed on the market only a few were fairl reliable. These were purchased, read, and their statement accepted as facts by those wishing to evade the payment c duties through a foreign country. The natural result was stampede of prospectors for the Copper River Valley route As to whether there was a Copper River route or not, wher it led, what it contained in the way of mineral, how the pros pector was to find it, and how he would extract it when found were questions too knotty to be considered by me. Appar ently the main point in view was to be landed on the shore of Alaska. A rumor existed that the Russians had used a trail going into the interior from the head of Port Valdez, or Prince William Sound, to the new El Dorado, the Copper River Valley. Pamphlets of the various transportation com panies, one of which existed on paper only, told them just how to go and what to take. Secret expeditions were fitted out which chartered vessels and which in due course of time cleared for the port of Valdez. This was late in the fall of 1897.

In the winter of 1897–98 the Pacific Steam Whaling Company, which had previously conducted an extensive salmon-canning business, entered the market as a common carrier of passengers and freight. Its first passenger vessel, the *Valencia*, sailed north in February, 1898, with some 600 passengers, accompanied by horses, mules, burros, and dogs. In crossing the Fairweather the steamer encountered heavy weather, necessitating the shooting of most of the livestock. This sensational item further advertised this route. When I arrived with my expedition at Seattle, early in April, to embark on this same steamer *Valencia*, I found a heterogeneous mass of people that were willing to put up with any inconvenience and pay almost any price to secure passage for themselves and freight space for their outfit north. Arriving at Port Valdez, they found the people who had preceded them some sixty days strung out along the trail from the landing to the foot of Valdez Glacier. The prospectors who had failed to provide themselves with pack animals now began for the first time to consider a means of transportation for their outfit of provisions, etc., from the ship to the interior.

All were provided with hand sleds about 18 inches wide and 6 feet long, which were valuable only as a means of transportation so long as the snow lasted and the prospector remained in good health to supply the motive power. From

the steamer to the shore, a stretch of some 300 yards of beach, these sleds were of course not available. To settle this important problem a miners' meeting was called with a view of inducing the company that had transported them thus far to place their outfit on shore above high-water mark. This knotty problem was still under consideration when I began to "back-pack" our outfit from the steamer over the beach to a cache on shore. Then these prospectors organized themselves into a commune and did likewise. Caching their entire outfit near the cache of the expedition led to considerable confusion, dissension, and bickering. Owing to the imperfect marking of the goods, there was a loss of many small packages. As parties would come nearly to blows, their grievances would be referred to some one of the "Government outfit," as the expedition was called.

Stringing out from the beach to the foot of the glacier, a distance of some 3½ miles, the prospectors commenced their journey to the Klutena Valley. They now began to realize for the first time the trials and hardships incident to the everyday life of those who ply their vocation on the frontier. They had neither the slightest idea regarding the topographical features of the country nor any definite plan of campaign as to their future movements. Where the leader wandered the balance followed. This was strikingly exemplified by the course of their trail, which led over the most difficult part of the glacier. As to how they should supply themselves with the two most necessary articles for camping, wood and water, they were utterly ignorant. Having climbed 8 or 10 miles of the glacier, the mountains on the side of which were utterly devoid of timber, they were forced to climb down again to secure water for cooking and drinking purposes. To save themselves this trouble numbers of them lived for days on uncooked food, borrowing water from the "old-timer," who had provided himself with oil and a stove to burn it. They were soon so galled by the excessive labor required to draw their goods over the trail that it was with the utmost pain they continued their labors. The sun in the middle of the day, beating down with its northern fierceness, made them snow-blind by scores. This misfortune made those so affected unfit for work. The causes leading to snow-blindness were rarely considered by the partner. When the afflicted man could not do his share of the work separations followed.

Friends of years' standing became the most bitter of enemies. It was no uncommon sight to see an organization stopping on the trail to dissolve partnership. When one considers the unexpected hardships these men had to face in their realization of the fact that gold dust did not line every river bottom, and that one in a hundred is a large percentage of successful prospectors in a mining stampede, it is not strange that a bitter feeling of resentment, no matter how unjust, should manifest itself. When members of the expedition were called upon in cases of this kind they did their best to divide the property as equitably as possible. Out of hundreds of cooperative companies that left Seattle, I think less than a dozen reached the interior of Alaska as an organization.

Beyond the glacier, the first point of any importance in the Klutena Valley located by the prospectors was known on the trail as the "Twelve-Mile Camp," which is 31½ miles from Valdez. Here the prospector found timber out of which to whipsaw material to build his boat. Innumerable styles and models of craft were used, and as a result the river banks were strewn with wrecks. That there were not more casualties from drowning is remarkable.

After passing through Lake Archer, the next congested point was at the foot of the lake, 75 miles distant from Valdez. Here starts the Klutena River, with a gentle, smoothly flowing current, which prevails for some 3 miles. Then the gradient increases to such an extent that from Amys Landing to Copper Center, 21 miles, where the Klutena debouches into the Copper River, is one succession of rapids. On the drift piles in the center of the river I noticed, while traveling the trail along the river bank, parts of boats, all kinds of provisions, clothing, etc., that had been washed down and lodged there from wrecks. These their owners were unable to recover, owing to the terrific current.

Copper Center, 99¾ miles from Valdez, on October 26, 1898, contained probably forty or fifty cabins. These would possibly average four persons to the cabin. From this point the prospector without pack animals must transport his outfit by boat. The boat, usually of the bateau order—a long, narrow craft, sharp at both ends—would have lashed to its bow a long, slim spruce sapling, and with a bow line some 70 to 80 feet long. When the boat was loaded and ready for the journey, one member of the party, who excelled in agility and ability

to clamber over the bowlders with which the river bank and bottom is lined, would take the pole in hand. The remainder of the "outfit" would seize the towline. The duty of the man with the pole was to always keep control of the boat, prevent the bow from striking against bowlders in the river and the boat from taking a sheer as it came out of an eddy into the swift current. Those on the towline supplied the motive power for pulling the boat upstream. This method is known in the vernacular as "lining her up" or "dropping her down" stream. From Copper Center there are two trails, or routes, indistinct and at places not marked at all except by small sticks used by the Indians to indicate a general direction, passing through the Copper River Valley. These lead to Mentasta Pass, which is the objective point for the Yukon, Tanana, and Forty-Mile districts.

The Millard trail, 22 miles the shorter, crosses the Copper River and, skirting the base of Mounts Drum and Sanford, takes the high ground of the big bend of the Copper; thence it follows an old Indian trail, and then strikes that river again at the south of the Slahna River, a distance from Port Valdez of 177½ miles and from Copper Center 55½ miles. The more northerly route follows the course of the Copper River, on its northern bank This crosses the Taxlena River 8½ miles from Copper Center. Here there is another small settlement, of probably ten or twelve cabins, built mostly by prospectors who have spent the summer on Taxlena Lake and the headwaters of its tributaries. Thirty-six and one-half miles from Copper Center I found another cabin, opposite the mouth of the Sanford River. Seventy-seven miles from Copper settlement is another small settlement, at the mouth of the Slahna. From this point there is practically no trail for a distance of 26 miles, as most of the prospectors have boated up the Slahna to Lake Mentasta. Here the last of the series of cabins built by the prospectors who entered the Copper River Valley during the season of 1898 were built. This is in Mentasta Pass, in the gateway to the Yukon, Tanana, and Forty-Mile valleys.

It will be observed that these settlements afford a continuous line of habitations from the coast on Prince William Sound to the Forty-Mile district in the interior. The supply of food in the Copper River Valley I regarded as ample for the winter and part of the season of 1899. Flour, that barometer of mining camps which indicates prosperity or failure,

fluctuated in price from $1.50 per sack, in the early part of June, to $9 per sack, in the latter part of September, when some placer streams were reported in the Tonsena Valley.

After getting into the interior and finding the maps and guidebooks purchased from "fakirs" in the States to be wholly unreliable, two-thirds of those who had successfully surmounted the glacier going in now became apprehensive lest their retreat over the glacier should be cut off by the melting snow. With the snow arches over the crevasses destroyed, these adventurous spirits would be compelled to spend the winter in the interior. As the expedition passed over the glacier in the interior, with their pack train of twenty-three animals, early in August, it was no uncommon sight to meet these people, thoroughly demoralized, coming out in squads of tens and twenties. They cursed the transportation companies liberally, but more particularly the commander of the "Government outfit," for not sending men into the interior ahead of them to cut trails and mark out routes over which they might travel to prospect the country. My belief is there were not more than 10 per cent. of the 3,500 people who crossed the summit of Bates Pass during March, April, May, and June who did not firmly believe they could pan out a fortune and return to their homes in time to eat their Christmas dinner. Hence their disappointment was bitter in the extreme, but not more so than in other mining stampedes of the last twenty years. The arrival of the expedition with the pack train at Copper Center effectually checked the stampede by giving a practical demonstration that where a pack train could go man could also travel with safety. The most frequent complaint met with by the expedition was that of individuals who had failed to get their mail, which they had expected the "Government outfit" to bring in.

The postmaster at Orca found it impossible early in the spring of 1898 to make arrangements with any of the prospectors to pack mail from Port Valdez into the interior. Hence he made arrangements with what is known on the frontier as a "squaw man"—that is, a white man who had married an Indian and to all intents and purposes had become one of them. This man, Jackson, proved to be a very satisfactory carrier during the earlier part of the season, but, like others of more brain power, he could not stand prosperity, and fell by the wayside. From this time on there were various

mail carriers. These, as they accumulated money enough to pay their passage south to the States, abandoned the mail, which in this way became scattered along the trail, to the utter disgust of the people as well as that of the postmaster. The latter afterwards had this mail collected and returned to Orca. All this could have been avoided had a postmaster been appointed at Copper Center and a paid carrier employed to deliver it at that point. Later in the season a post office was established at Port Valdez, but, no provision being made for the delivery of mail there, the mail for the interior continued to be delivered at Orca, on Prince William Sound, the terminal of the mail route for that district, and there it remained unless carried farther by private enterprise. This so disgusted the newly appointed postmaster at Valdez that he returned to the States, leaving matters in a very unsatisfactory condition relative to the delivery of mail to prospectors in the interior.

While the majority of the prospectors were crossing the Valdez Glacier, some two or three hundred others attempted to ascend the Copper River from its mouth and prospect what is known as the Chettyna district. The impression left on this route is of a negative character, owing to the fact that the rapids in Abercrombie Canyon are impassable, if no other impediment existed in the lower river to bar navigation below the mouth of the Bremner River. Here was established a small settlement of ten or twelve cabins of prospectors, who had ascended the Bremner River for quite a distance and had attempted to ascend the Chettyna. They were, however, unable to make more than a flying trip over the western edge of this district, owing to the swiftness of the current and the rugged character of the country through which it flows.

The time and money expended by the people of the United States now actually settlers in the Copper River district in Alaska in establishing an "all-American route" for themselves, over which they might transport their supplies without taxation by a foreign Government while in transit from the base of supplies in the States to the field of development in the unexplored sections of the interior of Alaska, may be estimated at $3,700,000. This voluntary contribution on the part of the people has located and imperfectly marked, with the exception of an interval of some 35 miles, the most prac-

ticable route for opening up to settlement the remnant of our frontier, in the development of which it has been the uniform policy of the War Department to go hand in hand, as it were, with the pioneer.

In conclusion, I recommend some action looking to the completion of the work begun last February by the pioneers now in the Copper River Valley, by the construction of a trail through the Keystone Pass of the Coast range of mountains, from the head of Port Valdez, Prince William Sound, to Thomson Pass, at the head of the Tonsena Valley, a distance of about 35 miles, and I only echo the united sentiment of these people that Congress ought to assist them.

THE ORGANIZATION OF AN EXPEDITION.

This, in my opinion, should be left entirely to the officer selected to conduct the explorations, for the reason that, if he is ambitious, his one aim will be success, and with that in view he will select only such material as will result in his expedition gathering the greatest amount of information and consolidating it in the most desirable form for presentation to his superior.

Only such enlisted men as are desirous of assuming the excessive labor and hardship incident to duty of this character should be detailed. The equipment of the expedition, the component parts of the ration, the form in which the packages should be prepared for shipment, and, in fact, all minor details, which mean success or failure to an expedition of this character, and which only experience teaches to the operator, should be vested solely in the officer conducting it. He should be given a suitable agent to take charge of his base of supplies and forward his rations, a clerk to prepare papers of accountability, collect the necessary data to cover the loss of public property, and render the necessary returns in due season.

This places the commander in a position where his mind is free from all care and worry incident to property accountability, and enables him to report on the data collected while such are still fresh in his mind. The flour portion of the ration should be increased from 18 to 22 ounces per diem. Fruit should be added as a component part of the ration; also saccharine tablets, as they are compact in form and less

liable to damage from rain. It is desirable that the transit line of observations carried from Port Valdez to the mouth of the Klutena River be continued through to the head waters of the Tanana, thus forming a base line from which a point of departure can be taken for compass stretches up the various valleys and rivers tributary to this line. This transit work should be given to an expert. To explore the Chettyna district a small stern-wheel steamer is absolutely necessary, owing to the fact that the river is so filled with quicksand that it is almost certain death from drowning to attempt to make a horse swim it.

In view of the distress usually prevailing in unsuccessful mining districts, I beg to call attention to the advisability of keeping on hand constantly at the base of supplies a small quantity of relief supplies for destitute miners and others coming from the interior en route to their homes in the States.

A MILITARY TRAIL RECOMMENDED.

As previously reported by Capt. P. H. Ray and others, the greatest factor retarding the development of the interior of Alaska is the abnormally high price of food. There is but one way that I know of to meet this condition of affairs, and that is the construction of a military trail by the Government from Port Valdez, on Prince William Sound, through the Copper River Valley, and into the heart of the mining section at the head of the Tanana River. This would give the prospector who owns two or three head of ponies an avenue by which he could reach that section of Alaska which we believe to be mineral-bearing. It will be an avenue of escape for the individual to whom the combination of conditions renders it necessary that he should return to the coast.

A military trail similar to that built through the Cœur d'Alene and Rocky Mountains in the early days by Bonneville and Mullen could, with an expenditure of about $35,000, be built into the Yukon Valley. The distribution of this amount of money would enable the prospector, who should be employed in constructing this trail, to earn enough to either return to his home in the States or continue the development of his prospects.

THE PERSONNEL OF AN EXPEDITION.

The personnel of an expedition to construct a military trail

from Port Valdez to the interior should consist of one competent clerk, two topographical assistants, two geologists, one expert on the agricultural products of the country, four miners for blasting trail through rock cuts, sixteen axmen, two cooks, eight packers, two noncommissioned officers and eight privates as a guard on public property, fifteen Indian scouts, one of whom should be rated as a sergeant. These scouts to be employed more as a safeguard against an Indian outbreak than as actual scouts, from whom, in consequence, routine garrison or camp duty should not be required.

The enlisted men of the expedition should, in addition to their regular equipment, be supplied with snow packs, leather-topped rubber boots, Kenwood sleeping bags, rubber boots, slickers, sou'westers, mosquito masks, and German socks.

ANIMALS BEST ADAPTED TO USE.

The animals used by the Government expedition and by the prospectors going into the Copper River Valley consisted of horses, both range and stall fed, mules, burros, and dogs, and of this collection the animal that gave the best service was the range pony which had been reared in the cold, mountainous country of Montana, northern Idaho, and Washington.

It was found that the stall-fed animal could not stand the cold blizzards and the rain. Most of them got pneumonia and died along the trail. The burros did not do well in the soft snow, and were worse than no transportation at all in crossing the cold, glacial streams. The dogs gave by far the best service on the crust of the snow, but their sphere of usefulness was practically limited to this mode of travel. During the summer months they were practically valueless, and their keep was quite an item of expense to the prospector.

The range pony best adapted to this service is what is known on the market as a "chunk," weighing about 800 to 1,000 pounds. He must have a small head, be broad between the eyes, have a slightly roman nose; short neck; deep, broad chest; short, heavy-muscled legs; big barrel; close coupled, big hams, and with all four feet well under his body. Sorrel and buckskin are the best colors.

He should be provided with a McClellan combination pack and riding saddle, with breast strap and breeching attached; a good blanket and sweat cloth to go under the saddle, and a light paraffined paulin to be thrown over the pack before the

final cinching during the day, which is to be used in covering the cargo during the night. It will be found that the hair cinch, while a little more expensive, is far more serviceable than the canvas cinch, which latter grows hard and stiff with constant wetting in fording streams and which galls the animal under the fore leg. The range pony having a thicker coat of hair than the stall-fed horse, stands the attack of the mosquitoes and flies far better. Should it occur that the flies and mosquitoes bite him to such an extent as to make his chest and the region about his ears raw, the application of bacon grease to these parts after a day's drive and the building of a smudge will in a short time heal up his sores.

It was found in comparing the range pony and the mule that the pony would pick his way through stretches of boggy country with less liability to mire down; that he could climb the glaciers and steep canyon sides where the mule would turn and go back, and that he would eat snow to quench his thirst when the streams were all frozen, which the mule would not do. When the country becomes cut up with trails which are well packed down by travel, the pony can not compete with the mule, from the fact that the mule will carry a far larger load and is more tractable in a large train. But for the purpose of prospecting, the trained pack pony is invaluable to the prospector and the best means of transportation he can take to Alaska.

In preparing an outfit all packages should be double-sacked, in 50-pound packages. The first sack should be of paraffined canvas and the second of unparaffined canvas. While this adds to the first cost of the goods, the additional amount of supplies that reach the interior in good condition, owing to the double sacking, more than repays for the original outlay. The packer's outfit, properly provided, should consist of a blanket sleeping bag with canvas cover, a blanket-lined canvas coat and trousers, a pair of rubber hip boots, snow packs, German socks, high-topped shoes, heavy woolen gloves, a slicker, a head net with mask, one change of heavy woolen underclothing, and an ample supply of woolen socks. In regard to the last article, he should be extremely particular in making frequent changes, as it is a failure to do so that results in so many frozen feet. The usual camp outfit of cooking utensils will meet the requirements of the trail.

REPORT OF LIEUTENANT P. G. LOWE,

Eighteenth Infantry, U. S. A.

FROM VALDEZ INLET TO BELLE ISLE, ON THE YUKON.

I made an unsuccessful attempt to ascend the Valdez Glacier on the 8th day of July, 1898.

On the 10th day of the same month I made another attempt, and was compelled to take an entirely different route, as the action of the sun on the ice was causing a marked change every day. I left the home camp at Valdez on the afternoon of July 13, 1898, and camped at the foot of Valdez Glacier, distant 3½ miles. Accompanying me were eleven picked horses, some extra horses, and three pack mules. The mules carried a sectional bridge composed of two pieces 12 feet long and some detachable crossplanks 4 feet in length. This bridge was to be utilized in crossing crevasses. When, on July 14, at 5.30 a. m., camp was broken every horse carried 150 pounds and each man led one horse. In struggling up the first steep ice two of the horses proved to be unequal to the task and were replaced by others. Nine of the horses, as well as the mules, were sharp-shod; the remaining two were entirely without shoes. It was soon discovered that the mules could not keep up with the horses, and I resolved to abandon the bridge and send the mules back, trusting to luck to get over the crevasses. The mules did not appear to be equal to the horses in activity and grit, and were constantly getting down into places on their backs, and did not want to be helped up. The bridge which I abandoned proved to be a blessing to some returning pilgrims, who used it for firewood, as there is not a stick of wood in the 29 miles of glacier.

By zigzagging I was enabled to find points along the crevasses narrow enough for the horses to jump over. In many places snow covered the ice, and the crevasses were not discovered until some of the horses had gotten a leg or two in them. Every horse managed to get one or two legs in a

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number of times, and they practically hung by their "eyebrows." At times it required the prompt and united efforts of the entire party to rescue them. One horse was saved by his pack striking the edge of the crevasse behind him, when he had both hind legs in. Had the animal not been sensible and quiet he would have struggled into some other position and gone down for good. This same horse probably saved the life of Private Hilliard, of the Fourteenth Infantry. The latter went down, but held to the horse's shanks, while the animal braced himself and the man climbed out. When the expedition had covered about four-fifths of the distance from the base of the summit a particularly dangerous place was encountered. It was covered with snow and was a network of crevasses underneath. It was, however, apparently the safest spot to be found, although the poles of the men would go through at every prod. The evening freeze was on and the snow was rapidly stiffening. The question was whether the snow would be found thick enough to sustain the weight of the animals. After some pretty stiff floundering the expedition managed to get through, but we had not an inch too much snow under us. Some footmen who passed by this place the next evening informed me that most of the snow had melted away and that the place was a network of yawning crevasses. There is one condition of glacier when it is safe to attempt to cross it—that is when it is covered with a thick coating of snow. At this time storms only are to be dreaded. This glacier is a fairly gradual ascent, excepting in one short, steep place near the summit, and its general direction is north and south. I found the summit to be 4,650 feet elevation and estimate the mountains on either side at six or seven thousand feet. The south slope is 20 miles long, and the north slope 9 miles from the summit. The last 3 or 4 miles of the ascent on the north side is along the ledge of a moraine. At the foot of the glacier a bold stream was crossed running out of it, and following down 2 miles we went into camp on the left bank at 12.30 a. m., July 15.

I afterwards found this stream to be the Klutena River, which heads at the north foot of Valdez Glacier at an elevation of 2,300 feet. The distance of 21 miles over this difficult trail was made in nine hours. It is the quickest time on record where horses have been used, although footmen have made it in less time. I never saw men perform a hard duty

with more pluck and endurance, and I can not award to them too much praise for their cheerfulness and bravery. July 16 all the men whom I brought over the glacier with me, with the exception of the civilian employees, A. W. Gumaer, John Cornwall, Sherman C. Stephens, and Stephen Birch, started for Valdez at 6.30 p. m. These men remained with me during the entire trip.

On July 17, the horses having become rested and filled up on excellent grass, the expedition moved down 2 miles to what is known as "Twelve-Mile." Here we found about 300 people in tents, waiting for the Klutena to go down to a stage that would make boating safe. Several thousand prospectors had pulled their supplies over the glacier during the spring, using horses, mules, burros, and dogs, and by hand. They continued sledding until the snow gave out, some getting as far as Copper River; but the majority sprinkled along the Klutena within 12 miles of the glacier, whipsawed lumber, and built boats of all sorts and sizes. Many used spruce gum as a substitute for pitch. Those who were ready when the water got high enough boated downstream; but those who were not ready before the river rose too high were compelled to wait for it to fall again. Several had already been drowned.

On being informed that it would be impossible to get my horses down to the mouth of Stephens Creek, 4 miles below, on account of high water, and that even if I did succeed in getting them there we could not cross, I sent Gumaer and Birch to examine the trail. My object was now to reach the creek and wait for a favorable time to cross, as these glacial streams rise and fall with the temperature, due to its action on the snow and ice. The valley at this point is half a mile wide, with picturesque mountains on either side. Spruce and alder are plentiful, and the grass excellent. Moose and bear are in the surrounding country, but the incoming prospectors and forest fires had driven them back from the trail. I found beaver dams, but the beavers had been frightened by having their dams cut. Men would cut the dams and place a net at the opening; the trout, feeling the water fall rapidly, would then rush downstream into the net. The timber contained plenty of grouse, fool-hens, squirrels, and porcupine. Musk-rats were to be found in every available water hole between the point named and the Tanana River.

On July 19 I attempted, without success, to ford the mouth of Stephens Creek. On the following day Gumaer, Cornwall, and Birch were dispatched to find the crossing, which they succeeded in doing. Stephens in the meantime had been sent back to Twelve-Mile to look for some files that had been lost the day before by a pitching pack horse. On the way back Stephens's horse lost its footing and dropped from a high bank into the swift stream. Stephens found it necessary to land on the opposite bank and then swim back. The unexpected tumble and sudden contact with the water would have caused most men to quit the saddle, but Stephens, who is considered one of California's best cow punchers, only found amusement in the adventure. Stephens Creek and a stream that empties into the Klutena from the right just across at this point are the same in size and very little smaller than the Klutena. In high water they are as dangerous as the latter.

On the following day, July 21, the expedition forded the creek without difficulty, although the water was very swift and high. In climbing a steep bank one horse rolled back into the water and could not get up on account of the weight of his pack. As the poor animal landed with his head under water, it required quick work to get him out in time. About a mile below the mouth of the creek several trails branch. By reason of this the expedition halted on the bank of the Klutena to reconnoiter. After following some trails for 2 miles, and finding that they led to saw pits, we went into camp amid fine grass and heavy timber. Whenever I came to a place requiring heavy cutting, or was in grave doubt as to what was ahead, I went to the front and explored an outtrail or went into camp, my object being to keep the horses from standing under packs, as a pack bothers a horse less when he is walking under it at his own gait than when standing still under it. As the animals subsisted entirely upon grass, it became very necessary to use every effort to preserve their strength. Owing to the scarcity of men for leading, and the fact that the packs would be torn and turned going through the timber if the horses were driven, the horses were tailed by tying the halter shank of a horse to the tail of a horse in front. The animals were divided into four bunches when the density of the growth did not require a man in front to help cut the brush and clear the trail, and each bunch was

led by a man. Throughout the entire trip I led the way with a camp hatchet and cut overhanging limbs and stubs of branches that would be likely to stop or tear the packs. Particular care had to be used, because we did not have mantas, and the contents of the packs were not double-sacked. I found the pack train indispensable; without it we could not have succeeded in the trip.

The afternoon of July 21 was consumed in following down the stream. After floundering in swamps and thick underbrush for three hours, I concluded that this route was impracticable, and that my only course lay in taking to the foothills. In the meantime, on returning to camp, I learned that Gumaer and Birch had found a way through the foothills, and that to make it passable there would have to be much brush and timber cutting where the fallen, burnt timber made it well-nigh impassable. To this was added the danger of falling trees, which were dropping at the rate of thirty per day.

July 23 was used in hunting a trail, but without success. The Klutena Valley widens to about 2 miles just before you reach the last camp, the river itself turning to the right and following the mountains that skirt the east side of the valley and continuing until it empties into a lake 11 miles below. Marshes, lakes, and ponds fill the flat on the left bank and extend to the foothills of the mountains on the west. In my meanderings in this vicinity I stirred up, to my surprise, several swarms of honeybees. I had previously been informed that there were no bees in that section of the country. After winding through fallen timber, July 26, for the distance of 5 miles, I crossed Canyon Creek where it empties into the southwest point of a large lake. Here we camped in heavy timber on the shore of the lake, 1 mile below. Canyon Creek is 40 yards wide, comes from the west out of a glacier, and has a slightly quicksand bed. I subsequently found the lake to be kidney-shaped, with the concavity to the east. It is 25 miles in length, and between 3 and 4 miles in width. The Klutena flows into it at its southeast point, and out of it at its northern end. The water of this lake is clear and deep. Prospectors sledding over it on the snow in the spring thought it a marsh. The elevation of the head of the lake is 1,700 feet.

July 27 camp was made 10 miles down the lake, in good grass and timber. Here I met with the usual experience of turning horses loose without hoppling, as several were some

miles back on the trail at the morning round-up. After this experience I always hoppled the wanderers and the natural leaders. The mountains here are much lower than at the glacier and less rugged. They finally disappear several miles below the lake. The mountains on the east skirt the water's edge, while on the west foothills intervene. Salmon Creek, on which the expedition camped, midway of the lake, heads in Lake Florence, 7 miles northwest, and runs through a cranberry swamp. It is clear, narrow, and fordable in most places. Lake Florence is 7 miles long and 3 miles wide. The trail along the lake is good and well beaten, and at its foot the expedition encountered a number of tents. Here the Klutena becomes the outlet of the lake at an elevation of 1,633 feet, emptying into the Copper River 30 miles below. The river is full of bowlders and rapids, and the trip down very uncertain. Went into a good camp 2 miles down the stream, and on the following day, July 30, 5 miles farther down, we found over 300 people, at Amy's Landing. It appears that Amy's boat upset here and he stopped to dry out his stuff. Those who came after him also stopped, and thus established a temporary settlement of considerable size. Two and a half miles farther down is Cox Landing, composed of two cabins. We camped 11 miles from the lake, the trail en route being good.

The mountains had been getting lower and lower all along, and at this point they disappeared 4 miles to the east of the river. Six miles farther down the mountains changed to foothills, 3 miles west of the river. After traveling 6 miles on July 31, the expedition ascended a steep bluff by a trail that had been cut out by prospectors. The bluff mentioned is 800 feet high, and a solid trail follows the edge of it 12½ miles to where it drops down into the Copper River Valley, at Copper Center. A similar bluff follows the right bank of the river. Copper Center is a large village of tents and cabins, and about 200 miles above the mouth of Copper River, which is 300 yards wide at this point and very swift, though not as swift as the Klutena, which empties into it here. The Klutena is not as wide as the Copper. Both rivers have the milky, slaty-looking water common to all glacial streams.

Copper Center is a sort of interior starting point, the objective appearing to be the head waters of the Copper and the Tanana. Upon arriving at Copper Center some of the

prospectors lined boats up the river, some packed a small supply of provisions across the big bend of the Copper, intending to build cabins somewhere in the upper country and return to wait for the first freeze to sled the remainder of their stuff up to their cabins, but more of them were waiting for the shore ice, and intended building after sledding up to where they contemplated putting in the winter. The majority were undecided. Quite a number of cabins were in course of construction; but more than half of the people who had come over the glacier had returned home disheartened, and I met no less than 200 returning prospectors between the glacier and Copper Center. The fabulous wealth of the country had been well advertised, but, the prospectors not finding any gold, the disappointment was too much for them. There may be gold in the Copper River country, but up to the time I passed through it none had been discovered, although several alarms had been sounded. The country was advertised before it was tested. Here the expedition first caught sight of Indians. They were hunting, trading, guiding, and asking for something to eat. They were Copper River Indians, and appeared to be clean and in fair health. The elevation at this point is 1,060 feet. The general direction from Valdez to Copper Center is magnetic north, and the variation of the needle from Valdez to Forty-Mile is 30 to 34 degrees. In speaking of direction, the magnetic reading will be understood.

Having traveled 100 miles over a practically known trail, most of it being well beaten, and finding that we would have to go at least 300 miles through an unknown country at a necessarily slow rate, I decided that more transportation would have to be procured to insure the success of the expedition. The maps had proved to be worthless, and the people interviewed told conflicting stories. Some of them dilated upon what they thought ought to be the case, but, after all, the information they possessed was merely hearsay. Three burros were purchased without difficulty. I figured that they could carry 100 pounds apiece easily, and that the 300 pounds would be all rations. I wanted to be sure that the expedition would have supplies to last it to the middle of October, as I calculated that I would be somewhere on the Yukon by that time, or beyond reach of aid. As the expedition could not carry enough provisions to winter the men, it was very evident that if they got through at all they must get through

before cold weather. The several hundred pounds of provisions which Lieut. Guy H. Preston, Ninth Cavalry, had moved over the glaciers on sleds in May were found to be available.

On August 3 preparations were made to start. I examined the banks for places to put the horses into Copper River with the prospect of their being able to make a comfortable landing on the opposite shore. Finally I came to the conclusion that, although the animals could in ordinary water be induced to attempt swimming the distance, the swiftness of the current, as well as the extreme coldness of the water, would cause them to turn back. Believing that swimming them behind a skiff would be in every way better, I made a successful test with some of the best water animals. I swam them to an island, and from there they were led behind a boat, two at a time, with a man in the stern attending to each horse. The lariat was paid out to suit the convenience of the horse, the boat conforming as much as possible to his swimming capacity. The burros were hog-tied in the bottom of the boat. Men and property having been successfully crossed, we went into camp at the mouth of the Klutena.

While the crossing was taking place the bank was lined with spectators, and bets were even as to whether we would get over without accident. On the following day, August 4, the horses were divided into three bunches, with one man bringing up the rear, guiding the burros. One mile above camp the party crossed the Klawasina River. This was found to be a shallow stream of reddish water, and about 10 feet wide. The banks showed signs of an occasional rise, and it must have been called a river during one of these rises, for at other times it was a modest creek.

At the mouth of the stream what is known as the Millard trail starts off at N. 10° E., crossing the Klawasina half a mile from Copper. This trail was cleared under the leadership of Mr. B. F. Millard, who got a lot of men together, and while some cut trail others back-packed the food supply. It is between 60 and 70 miles long, and reaches almost across the big bend of Copper River, and is very plain in the timber, but the pliable moss on the bald prairies will not sustain a beaten trail, and it becomes extinct in places. The expedition camped this day on a small stream 9 miles from Copper Center. The trail was good for footmen and the ascent was

gradual, but the numerous small streams have steep banks, and the horses had to be frequently untailed. Just before going into camp two of the horses fell back into a creek and had to be unpacked. The timber got smaller as the expedition ascended from Copper River. Camp was established 16 miles north of Copper River August 5. Here the expedition saw for the first time Mounts Drum and Sanford, which could not be hitherto seen on account of clouds. The expedition was too far forward to see Mount Tillman, which is behind Sanford. Drum is said to be 13,300 feet elevation; Sanford is 13,000 feet. Sanford appeared to be the higher, and I did not have occasion to change my opinion up to the time they were lost to sight. Both mountains are covered with snow down to their bases. The ground ascends from all along the big bend to the immediate bases of the mountains, giving them the appearance of two white mountains perched upon an elevation. Sanford is smooth, and on the haycock order, while Drum is rugged. The country between the river and the trail is dotted with lakes, ponds, marshes, and streams, making it necessary to keep to the high ground. The trail during the day was generally good, though we went through some marsh, and two of the horses getting down in a creek gave us some trouble.

In proceeding on the journey, August 6, I found great difficulty in keeping my trail. The country was rolling prairie, with an occasional patch of trees. Passing down a steep bluff, the expedition camped in heavy timber and good grass on the left bank of Sanford River, 29 miles from Copper Center. The Sanford is considered one of the worst streams in the Copper River country, with its ever-changing channels and constant rising and falling. Quicksand, too, has to be guarded against. There have been many accidents, but no casualties. It is formed by two glacier streams joining at the head of Emilie Canyon. These streams lie between Mounts Sanford and Drum. The banks are high and steep, and the river runs N. 75° W. Mount Sanford is N. 63° E.; Mount Natalie, a beautiful spur of Mount Drum, S. 52° E., and Mount Drum S. 37° E. Currants and blueberries were in abundance.

After several attempts, we succeeded in crossing and in climbing the steep right bank. Camp was made at the crossing 6 miles below the rolling prairie, on a small creek, with

grass plentiful and trees scattering. During the day we encountered reindeer moss, and afterwards traveled through it for miles. I believe that this moss extends many miles upstream and a long distance to the east toward the mountains. It is found on high ground devoid of timber. On the following day the trail was lost 2 miles out, and we went into camp 7 miles farther on in a dry creek bed. The grass was good, but the wood small and very scarce, and the water was supplied from a small spring. Our route was now changed to the north, along which it crossed a dry creek bed 4 miles from camp, which gave evidence of being a wicked stream in high water. From this point the mouth of the Chestalena River, where it empties into the Copper, is N. 65° W., and about 10 miles distant. The two streams appeared to be about equal in size, and the Chestalena, up which we could see for miles, drains a country having fewer lakes and marshes than the Copper River Valley. But of course this could not be determined from the position of the expedition.

The camp this day was made on the right bank of Boulder Creek, a swift, half-clear stream. On the following day, moving in the direction N. 10° E., we got tangled up in some moss-covered rocks 2 miles from camp, and it was with great difficulty that the animals were extricated without breaking their legs. They were continually getting their legs in between the rocks, being unable to see where they were stepping, and one of them received a gash that caused much trouble afterwards. A wide swamp was crossed and camp made on a small rise near a shallow pond 6 miles from Boulder Creek. The timber was scrub and the grass good, although the stock were so worried by mosquitoes and gnats that they were constantly on the move. Just before making camp the expedition passed through an old caribou fence. These fences are built by the Indians and shaped somewhat like the letter V, extending several miles. The caribou follow along the fence for an opening and are received by the hunters. On August 11, after 4½ miles through scrub timber, at the end of the Millard trail, on the point of a low ridge, with Copper River less than 2 miles to its left, we followed along the ridge 2 miles at N. 30° E., through thick, small timber. Here camp was made in a swampy moss flat, in heavy timber, with grass scarce.

But a short distance was made on August 12, and camp was established only a mile distant from the starting point of the morning at N. 40° W., on the left bank of Copper River, and again in heavy timber and good grass. In the big bend in this vicinity many moose, bear, and caribou trails are to be found between the river and the mountains, running in almost every direction. Higher up goats and sheep range. On the high ground the marmot occasionally whistles, and the prairie hills are dotted with little mounds similar to those made by the ordinary prairie dog. The occupants are similar, only with longer hair. The Indians snare them and consider them good eating. In the spruce timber the porcupine and a small gray squirrel are found. The porcupine is rather long on flavor and short on flesh in the early spring, owing to his having to eat spruce bark; but when fresh vegetation affords him a change of diet he rapidly develops into a savory morsel. Rabbits are found in scrub cottonwoods along the river banks. Ducks and geese are scarce compared to the coast flocks. Fool-hens and grouse hatch in this section, and a few ptarmigan, although the latter are more numerous on the bald mountains north of Tanana. Alaska is even with Ireland on the snake problem, except in frogs and toads. Of these there are many.

Strawberries by the acre are found in places on the coast, but the berries in abundance in the interior are the blueberry, cranberry, raspberry, blackberry, gooseberry, huckleberry, and currant.

On August 14, accompanied by Cornwall and Stephens, I succeeded in finding a ford through an island half a mile below camp, having good grass, alder, and heavy cottonwood timber. On the following day I moved with my outfit to the island and proceeded to make a raft with which to cross the main channel of the river. My tools were three axes and an auger. The raft was finished and launched the following day, and the occupants, lightly clad, started for the opposite bank on the trial trip. The channel was about 30 yards wide, the current very swift, and the raft was immediately at its mercy. To pole was the original intention, but it became evident that oars only could be used, and that a landing must be effected on any shore possible. The raft passed close to the home shore and Birch jumped with the rope; but his feet were instantly swept from under him and he found himself in deep

water. He was very cool, however, and held to the rope until hauled on board. The current took a change for the better, and a landing was made on the other shore. The raft was then lined well upstream, but in coming back the same difficulty was experienced with the current and a tie-up some distance below the camp had to be made. I now decided to make oars and cross half of the stuff at a load, the latter so divided as to insure a comfortable return to Copper Center, for should one of the loads be lost, such a calamity would cause the expedition's making a trip to the Yukon an impossibility, owing to the lateness of the season. Toward evening a boat was spied coming downstream. Hailing it, the occupants were induced to tie up for the night and ferry the stuff of the expedition across next morning for a consideration.

It took several trips to ferry the property, and camp was made on the edge of the channel. On the following day we started up the right bank of Copper River at N. 30° E., and after some hard work through heavy moss and scrub timber for 3 miles a well-beaten Indian trail was struck, which led for some distance along a ridge through a fine birch wood. Five miles above the last-named camp the Slahna empties into the Copper. It is a slow stream, fordable in many places, 50 feet wide, tortuous, and the last 20 miles of it is through swampy land. Like Copper River, it has gravel, sand, and muck banks. Two miles above, camp was made, near the mouth of Gertrude Creek, which I have named for little Miss Gertrude Wagner, daughter of Col. Arthur L. Wagner, assistant adjutant general. It is a bold, clear mountain stream and was alive with trout, although they did not rise to a fly.

On the left bank of the creek, close to where camp was made, a gravel bluff rises 600 feet and is visible for miles from the opposite bank of Copper River. Persons wishing to cross the river from the left bank should continue along the low line of hills from where the Millard trail ends until opposite the gravel bluff. At this point the river is a network of channels and easily forded, and there is also a good ford across the Slahna.

From this camp one can look up the Copper River, N. 80° E. Mount Wrangell is seen to the left of and beyond Mount Sanford. It is crater-like, with snow-covered sides, and has the appearance of a large cone with the top knocked off. It is said to be volcanic, but was not at this time in action.

As we proceeded two of the horses had been pulling back considerably, so that I was compelled to untail them, and they were driven as loose horses between bunches. A rope had been used under the tails of the horses to make them keep up. It was found, however, that there was not enough rope in hand to go around. This proved to be very fortunate; for as the expedition reached a point 400 feet up the side of the steep bluff, a short distance from the camp, one of the loose horses rolled down hill at a fearful rate, upsetting saplings on the way, and finally wound up in a swamp from which he was extricated with much difficulty. If one of the bunches had started down like this, matters would have been interesting. The Indian trail was followed until it ran out, and after some hard work through thick timber, camp was made 5 miles above the mouth of Gertrude Creek, in fallen timber and good grass.

For 30 miles from its mouth the right bank of the Slahna is guarded by a line of hills, with narrow marsh lands intervening, but above this the mountains come in closer and take the place of the hills. From the left bank starts a lowland of lakes, streams, and marshes, extending up Copper River as far as the eye can reach, and skirted on the left by a range of mountains. This valley is more than 15 miles wide. Off in the valley to the east I saw smoke, which I concluded must come from the Indian village near Lake Suslota, 10 miles away.

Some of the animals that had strayed away were hunted for on August 20 and were subsequently discovered in the evening grazing on the banks of the Slahna. Stephens, who had gone into the hills to look for them, ran suddenly upon two brown bears eating blueberries. He wounded one with his pistol, and the startled bear, not knowing from whence the shot came, ran toward him. Several more shots were fired, but without result.

Camp was made on August 21 on the bank of the Slahna, 16 miles above its mouth, in an abundance of swamp grass and heavy timber.

On the following day I could not get my bearings accurately, owing to constant changes and uncertainties. From this point the general direction is N. 20° W. The expedition moved along a short distance, then followed to the left a trail that had been used by some prospectors back-packing from

their boat on the Slahna to a claim they were working in the hills. About 1½ miles up this trail we bore to the right, climbing a steep hill and following down along continuous hogbacks a couple of miles. The mountains on the left were then passed. As the river again came into view I caught sight of a sheet of water on the other side, which, from its size, I concluded must be Lake Mentasta. I made for it as well as the swamp and trees would permit. It was lucky that I did so, for I found out afterwards that a number of people had followed the Slahna up to its glacial source, under the impression that it headed in Lake Mentasta. The party ran into a difficult piece of marsh 23½ miles from Copper River, and camped in good grass and scrub spruce, with poor water. In the afternoon I sent Gumaer to hunt a way to the river. The mosquitoes and gnats were something awful. During the day we noticed that the burros crept in behind the tail of the rear horse of each bunch to get the benefit of the switching of the tail. This was an exhibition of cunning on the part of the burros, as the pests were very thick.

Camp was made August 23, after traveling 2½ miles at N. 10° W., on the river bank. A regular ford was discovered 2 miles upstream, where it was ascertained that we could cross just above the camp. Stephens had made an attempt to cross right at camp, but found the quicksand too bad; so he and Gumaer crossed at the ford and brought back a Tanana buck who had come into that region to court a Copper River maiden. On the way back Stephens's horse fell down a bank 50 feet to the water's edge; but he did not appear to mind it much, for he nipped at a bunch of grass the instant he landed. In the meantime another Indian had perched himself comfortably on the bank to watch operations. He was perfectly immovable until he saw his companion gorging himself. This was too much for him, and he immediately waded the icy river and sat down to profit by our hospitality. This Indian proved to be a really intelligent young man, and told me that he was Albert, son of Nicolai, who lives well down the river. Both Indians spoke English, and gave much valuable information as to the country beyond. Albert gave information that there was a good trail down the left bank of the Slahna. We took the right bank because it appeared to be less swampy; but what might be a good trail for Indians might not be

practicable for animals, and, not having tried it, I do not recommend it.

On August 24 the expedition crossed the river and reached "John's" house, on Mentasta Creek. It is a good-sized slab affair, and the population consisted of 10 men, women, and children, and plenty of dogs. Here the Indians catch the salmon as they come up the creek to spawn in the lake, adjusting the weirs from a footbridge that spans a creek at the house. This stream is clear, 2 miles long, and runs out of the lake into the Slahna. Some fish were offered me, but they appeared to be too ripe for comfortable eating, and I refused them with all the reluctance I could assume.

All the grown Indians, both here and on the Tanana, have been confirmed in the Greek Church, and have testaments with this fact stated on the fly leaf. When a white man comes along, the Indian appears with his book and presents it with great solemnity. Knowing this custom, many have placed notes in these books giving information to friends who were following them. Some would-be clowns took advantage of the simplicity of the Indians and put in slips of paper containing sayings they evidently thought were funny. But in almost every case things which were said were meant and the Indian's good intentions respected. Most of the natives had consumptive coughs, and a little girl informed me that her father, mother, brother, and two sisters were "a-l-l g-o-n-e," and that she would go some day and join them. These people do not have canoes. They sometimes make boats and go downstream, but they invariably return by trail. They usually carry a paddle and on reaching a stream lash three or four pieces of wood together with withes and paddle across.

The creek crossed, the expedition moved up its left bank 1 mile to Mentasta Lake, thence 2 miles up the lake to where it starts through the pass. On the way up the horse that had rolled off the bluff near Gertrude Creek attempted the same rôle, but was saved from drowning by the intervention of a tree. Mentasta Lake is, as nearly as I was able to judge, 2 by 2 miles, and contains many diminutive islands.

The graveyard, just above the village, shows a pretty heavy death rate. When an Indian dies the others seem to take it as a matter of course, and all for the best. The deceased is placed in the ground and a frame erected; but since the pros-

pectors have brought so much extra canvas into the country the natives of Mentasta have pitched small tents over some of the graves. The grave decorations are on the fantastic order, anything in the line of brilliant covering being acceptable. Just why they have the elevated caches right in the graveyard at this point I did not think to ascertain.

The Copper River Indian is of medium height, well built, and not fat. He stows away a quantity of fish for winter use, and although the mass of fish to be caught would feed an unlimited number of people, the Indians do not appear to cure enough, and invariably go hungry before the next run of salmon. They are also improvident, and are compelled to live to a certain extent upon roots. In the spring most of them suffer from consumptive coughs. Lack of nourishing food and exposure probably cause this. They are most accommodating and good-natured, and will go out of their way to put you on the right trail. Of course, they will get as much out of strangers as possible, and will drive a pretty stiff bargain, but they are by no means vicious.

From Mentasta Lake Mentasta Pass runs N. 60° E., and is about 1 mile wide and skirted by high mountains. The pass is so nearly level that the summit, which is 2 miles from the lake and of a 2,300-foot elevation, can be determined only by the different directions of the water flow. Although we did not have time to examine the Tokai River, I am satisfied that its source is somewhere near the summit of the pass. I now felt that we were getting somewhere, for the Copper River drainage had been left and the direction of the Tanana waters was being followed. Camp was made 10 miles from the lake, in good grass and heavy timber. For the first time we were entirely free from mosquitoes and gnats, and they did not trouble men or horses again until they entered the Tanana flats. All streams in the pass flow from left to right into the Tokai. The trail was well beaten, numbers of prospectors having packed over it. A trail passes Lake Suslota about 20 miles southeast of Lake Mentasta, but according to Lieutenant Allen's report it must keep well to the right and join the Mentasta trail at Nandells village, near the Tanana.

Traveling 3 miles N. 30° E., on August 25, we came to a point where the trail forks, the trail to the left going due north and appearing to follow down the left bank of the Tokai, while the one to the right goes northeast and crosses

the river half a mile farther on. The river is 30 feet wide at the ford, clear, with gravel bottom, and not deep. The left-hand trail was so well beaten that I chose the right, because it promised higher ground. From the ford the river runs N. 35° W., and there are also two passes, the one northeast, which I had chosen, and another due east. Three miles from the ford we ascended a steep bluff, 200 feet high, and in doing so several of the horses fell down. Half a mile farther on a dry creek bed was crossed, and following it up 4 miles camp was made on a bold mountain stream which sinks into the ground. While we were struggling with a mired horse two of the burros went ahead and took station under the ridge-pole of an old tent support, practically picking out a camping place for us.

On August 26 we turned into a branch canyon, N. 5° E., and followed up a creek bed and mossy trail 1½ miles, then ascended a mountain 2½ miles to an elevation of 4,500 feet, when we found ourselves on the summit of Meiklejohn Pass, with Mount Thomas rising several hundred feet on the right, and on the left a deep canyon and high mountains. Here we halted to view the great Tanana Valley beyond. In the distance was a low line of mountains running perpendicular to the present course. To the right was Lake Wagner, a sheet of water about 8 miles in diameter. The travel over the pass and on both of its approaches is through heavy, wet moss, that will not sustain a trail. From here the direction is again northeast, and a descent of 6 miles is made over difficult ground, through tangled underbrush, burnt timber, and leaning alders, to where the beaten trail begins. Three miles after leaving the summit one of the burros played out completely and had to be abandoned. Following the trail 4½ miles, camp was made on Lake Wagner, with good wood and an abundance of grass. Just before going into camp a narrow bit of swamp gave some trouble, a horse and a burro getting down. The elevation of the lake is 1,900 feet. Low mountains border the west shore, continuing to the Tanana, most of the remaining boundary being lowland and marsh. The grass on the lake was taller and more abundant than anywhere else on the trip.

Traveling along the shore at N. 80° W., the lake was left, and 2 miles farther on the party crossed a fine stream running southeast. I was unable to determine what became of this

stream, as it ran from the direction of the lake toward the mountains, and did not cross it but once, and yet touched the mountains on both sides of the crossing. It probably empties into some marsh and oozes out in small mud creeks. One and a half miles after crossing the creek two of the horses got into a mudhole, and it appeared for a moment as if they were going to sink out of sight. It required more than an hour to extricate them. One mile farther on we camped, on the right bank of the Tetling River, a slow, clear, deep stream about 10 yards wide and with muddy banks. This stream empties into Lake Wagner not far from the trail. This is evidently an Indian fishing ground, as the fish cache, two rafts, and a birch-bark canoe were discovered. It froze during the night, but the mosquitoes were singing their roundelays in the morning just as chirp as ever. On following up the Tetling River, August 28, we were met by three Indians with guns, who had evidently seen the party coming, and whom they escorted to the village. To reach the village the members of the expedition had to go down and up steep banks and cross the river on a footbridge; but the horses gave no trouble, as they had become almost equal to tight-rope walking by this time. Six good log houses constitute the village.

The absence of the Copper River Indian sweat-house was noticeable, also the cough. These Indians seem to be and to feel superior to the Copper River native, both physically and intellectually; probably due to the Yukon trader and his nourishing food. The members of the expedition went through the usual book post-office formation, and I employed a guide named Johnny, and moved N. 10° W. 8 miles, going into camp between Lakes Gumaer and Birch, which have a portage of 200 yards. Tetlings was only 3 miles away, but I did not feel that we could afford to feed a whole village.

On August 29 we stopped at Tetlings, and was met by Chief David and his post office. Tetlings consists of four log houses, and is on the right bank of the river of that name. This river flows past Nandells, feeds Lake Wagner, flows out of the lake, passes Tetlings village, and empties into the Tanana 7 miles below. I was much surprised to learn that salmon do not come up the Tanana as far as Tetlings River. I believe that the Indians put up pickerel instead. The Tanana Indian lacks the impenetrable expressionlessness of the noble red man as depicted by Cooper, and seems to enjoy a joke as well

as anybody. They are honest, too, and can not be induced to touch a cache that does not belong to them. It is to be feared that contact with the white man may in the future cause them to be less scrupulous, although it must be said of the more than five thousand people who came into the Copper River Valley last season that only one case of theft from an Indian cache was reported. It seems to be a point of honor and a custom with guides not to conduct travelers past the next village. From Mentasta a guide can be taken as far as Nandells, but from Nandells to Tetlings a new guide must be procured. Indians from both places conduct to Forty-Mile or Dawson, as there are no villages intervening. From Tetlings, with our newly acquired guide, Peter, we traveled downstream, N. 30° E., 1½ miles, and unpacked and back-packed the stuff over a footbridge across a still, deep stream, swimming the animals at another point. From here the course ran N. 10° E. on good, hard trail 4½ miles to where the Tetlings empties into the Tanana, which stream we followed up 1 mile and camped in heavy spruce timber. The horses were compelled to go back a mile for grass.

The Tanana at this point is 300 yards wide, and the current is quite swift, although nothing compared with the Copper River movement. The banks are soft sand and quicksand, with neither rocks nor gravel. The water was clearer than that of glacier streams we had crossed, but none of the men relished drinking it. I had intended making a raft, but on seeing the treacherous banks and an island of quicksand just across the channel, and considering that if an attempt was made to drive the animals across they would make for the nearest point of land, which would be this island, I concluded that the raft should be used only as a last resort. The banks being quicksand, it would be necessary to land the animals at a given point to avoid miring. Only two horses at a time could be led behind a raft, and it would move so slowly as to greatly endanger drowning them. To pull the raft up the opposite bank, through thick brush and on uncertain footing, would resolve itself into a mammoth task. This would occupy at least four days. I sent Peter back to Tetlings village for his father, Nonene, and Johnny, who both owned canoes. There was some doubt about being able to induce them to come, as they were to start on a caribou hunt next day, and their winter supply of meat is more than money to them.

Although they possessed money to purchase meat at trading posts, they could not transport a sufficient quantity to keep them through the winter. Game and fish are the staples, the stuff purchased at trading posts being luxuries.

Two canoes rounding the point at the mouth of Tetlings River, August 30, and which were then paddled up the Tanana, were, indeed, a welcome sight. The Indians were given the best breakfast we could muster, even including sugar, which was getting low. The canoes were lashed together by two rods placed across and fastened with withes, at the same time every precaution being taken against abrasion. Each Indian paddled his canoe, while Stephens knelt in the stern of one of them and led the animals across one at a time. Every man had his favorite horse, and their swimming, which was obliquely downstream, required from two and three-fourths to four minutes per trip. The burros swam without difficulty, although both went in over their heads at the start. The property was next transferred, and, this being accomplished, the expedition went into camp on the left bank of the Tanana at sunset. After paying these good friends and stuffing them with all they could eat, we bade them farewell. These Indians had never seen a soldier before, and the traders had impressed them with the idea that the soldier is a very important representative of the Great Father in Washington. The Indians could say McKinley, and knew that he was President, and said they expected he would come up and see them some day. I gave each of them a recommendation, stating that they could be thoroughly relied upon, so that travelers would not be in doubt. Johnny contemplates building a skiff for ferrying. It would certainly be a great comfort to people passing through the country if they could be sure of a boat at this crossing. The elevation here is 1,650 feet.

We had now burned our bridges behind us, as the Indians were off for their annual caribou hunt, and the distance in any event back to Valdez was so much greater than that to the Yukon that the latter became the preferable objective. Upon leaving the Tanana we entered a country that has not been mapped from actual observation. Information was obtained from the Indians and the country was mapped as well as the imagination would allow. An Indian will tell you it is so many "sleeps" to a certain place, packing so many pounds on your pack, but he can not tell you the

number of miles, and as there is a difference in the endurance of Indians there is a difference in the number of "sleeps." Their description of direction is not good, maps made in the sand being usually on the straight-line order, although they are very intelligent about it and give pretty clear information. Prospectors also add to the store of knowledge, but they are apt to see only a small part of the country and conjecture the remainder of the information.

From Johnny it was learned that after crossing certain streams we would ascend a high mountain, where the trail would disappear. We would then pass between Miller and Glacier creeks, emptying into Sixty-Mile River, and Davis Creek, emptying into Forty-Mile. A store at the mouth of Miller Creek now became our objective, as there information could be obtained as to what was ahead and whence a beaten trail could be followed to the Yukon. A sketch made by Johnny proved more accurate than the map we were obliged to rely upon and not so misleading. The map caused several days of hard and useless work and the loss on the trail of five horses.

August 31 we traveled 4¼ miles N. 10° W., part of the time through a swamp up to our waists, to the northwest point of Lake Edith. This is a picturesque piece of water 8 or 10 miles in length and 1½ miles wide, bordered on the north by low mountains and on the south by marsh lands. From here our course, 1½ miles along the lake, was N. 80° E., then north 1 mile to the summit, the trail being hard and good; thence down a valley through lumpy moss, following a creek 3 miles farther on to a forced camp 10 miles north of the Tanana. Camping here was almost compulsory, owing to burnt grass and timber on all sides. It was an oasis in the desert. The following day Gumaer attempted ventriloquism to drive the burros away from the camp fire, and was so successful that he had to walk back to Lake Edith for them. Two miles from camp on a good trail we crossed a creek running east, and after a 3-mile travel over heavy moss changed to N. 20° E. One mile farther a creek was crossed running east, and a low mountain was ascended on a good trail, which the party followed 2 miles to where the course changed to N. 5° W. for half a mile. We now went N. 10° E. 3½ miles through heavy moss and camped in thick, small timber, with plenty of grass.

September 2, after traveling 6½ miles through deep moss,

camp was made in good grass and a thick growth of small timber. It rained hard during the night and froze before morning. The day following we ascended a divide, leaving the creek we had been following for several days running to the right, probably joining some tributary of Sixty-Mile or of the Tanana. Passing over the divide, the party struck a creek 2 miles from camp running toward them, then bearing to the east. After traveling through moss and burnt timber 5½ miles camp was made, in good grass and fallen timber, on the right bank of the creek near its head. Frequent halts occurred during the day to "hunt trail," and in crossing marshy streams several of the horses got down. It froze early in the evening and rained toward morning.

The next day we ascended a divide 1 mile, then traveled up and down hill 2 miles through burnt timber, the horses constantly sinking in, sometimes to their knees. One horse fell twice, and I was compelled to leave him and camp at the first favorable spot, as it was feared the other horses could not stand the strain much longer. We camped in a swampy place that had escaped the ravages of the flames, and the abandoned horse was brought in later in the afternoon. This had been the hardest day on the animals, and they began to show decided signs of weakness. The frost had severely scorched the rank, juicy grass, and the horses were feeling keenly the lack of nourishing food. On this day we passed more perfect moose horns than on any other.

Water was running all about the camp, and the members of the expedition were compelled to wear rubber boots during their stay in this spot. It was necessary to place several layers of spruce boughs for beds and pitch the shelter tents over them. In driving the tent pins solid ice was struck 8 inches from the surface of the moss. Wood in the immediate vicinity was very scarce, but half a mile from camp the animals found plenty of grass. I went downstream in the afternoon hunting trail, hoping at least to find a camping place a short distance away to which we could easily move and where rubber boots would not have to be worn; but the burnt timber extended so far that I saw plainly that the members of the expedition would have to sacrifice themselves for the horses and remain where they were. I was of the opinion that it would not be wise to move the horses until a camp could be found somewhere ahead.

September 5, 6 miles were traversed. Birch and I ran upon a stream 15 feet wide, with gravel bottom and with deep holes. It ran to the left, and I at once decided that it must be Walkers Fork of Forty-Mile River, as we must be between Forty-Mile and Sixty-Mile, and it was the only available stream of its size in that direction shown on the map. "Johnny's" map showed that the expedition would cross Forty-Mile, but I concluded that any important tributary would be Forty-Mile to him, which in this case proved to be correct. The Government map was decidedly in error. The stream afterwards proved to be Dennisons Fork of Forty-Mile and heads much to the south of Walker. I believe that Walkers Fork had been discovered.

The day following, September 6, when the herd was driven in, Stephens reported that the black horse that had given out was in a soft place and too weak to help himself. After packing up, his saddle was cached, intending to let him follow if he could, as he might be used for food if necessary later on; but when I got him up he could not stand. When the horse heard the rumble of hoofs, as the pack train approached, he raised his head and neighed, seeming to appreciate that he was being left. It was a farewell to his comrades. After the train had passed I shot him. This was the frost's first victim. The Indian trail was followed N. 15° W. 1½ miles to where it ran out in the burnt timber and heavy moss, and from here we made our way 4½ miles to the Forty-Mile tributary and camped at an Indian crossing, in good timber and grass. To save a day of trail hunting, I sent Gumaer upstream and Cornwall downstream in the afternoon. Gumaer came in after dark with the information that he had found plenty of old Indian signs and a well-beaten trail on the mountain side 1 mile from camp.

The banks being very abrupt, on September 7, two of the expedition crossed, and, throwing a rope over, led the animals across one at a time. Nearly a mile was traveled through deep, wet moss, when a course was struck due north along the trail which follows parallel to the side of the mountain. Since leaving the Tanana we had encountered only low mountains, but they were now getting higher rapidly. The Forty-Mile tributary, the north side of which was being followed up, has high mountains on both sides, and flows through a valley between 1 and 2 miles wide. Occasional

swamps were crossed, but the trail proved generally good until we struck burnt timber. Here two burros had to be abandoned, as they were done to a turn. After traveling 8 miles the course changed to N. 25° W., and 1 mile farther camp was pitched on the left bank of a fine stream, with splendid timber, and the only patch of grass within a radius of 5 miles that the fire had not destroyed. While crossing the camp one horse got down in the creek, but did not give much trouble. To lighten the packs as much as possible, some articles that could be dispensed with were discarded.

Our course on the day following, September 8, was N. 5° W., and after traveling 1 mile through swampy moss a high mountain range was ascended, on a hard trail and through heavy timber, until near the summit, where both timber and trail disappear. The ridge was a constant down and up, over alternate moss and stone, with an occasional caribou horn to mark the route. Nine miles of this journey was a very severe task for the animals. There was no immediate prospect for wood and grass ahead, and the caribou horns had long ago run out. I dropped down about 1,300 feet into a canyon opposite the head of the Forty-Mile tributary, where grass was good and timber scattering. The elevation of the trail I estimated to be about the same as Meiklejohn Pass—4,500 feet. The elevation of the camp finally made was 3,150 feet. It froze hard during the night.

On September 9 Gumaer was sent down the canyon and went with Birch along the divide to try and decide what course to pursue on the morrow. Sixty-Mile is more than 10 miles south of Walkers Fork, flows parallel to it, and according to the map we were at the head of the latter. To reach the mouth of Miller Creek, which flows into Sixty-Mile, it would be necessary to bear south of east. I determined to squander a few days in an endeavor to find the creek, but made up my mind that in case of failure I should strike due north as nearly as the terrain would permit and reach Forty-Mile, which I knew must be in that direction. Once on the Forty-Mile, we would, no doubt, have to abandon our horses and back-pack downstream until either prospectors were met with boats or a trading post reached at its mouth, the river being too full of rapids to make anything but occasional rafting safe. But I was loath to try the forlorn hope until every effort had been made to find Miller Creek, as from there the

expedition would have a beaten trail to Forty-Mile. To break the trail would mean almost sure death to the animals, as the snow was beginning to settle conspicuously on the high mountains, and there was danger that they would give out before the river could be reached, in which case everything would have to be abandoned except what the members of the expedition could carry on their backs. Stephens expected to remain in the country and shift for himself as soon as I was through with him, and to have to throw away his stuff when everything was so high-priced would prove to him a serious loss. There were many articles of private property that would have to be abandoned, even if the expedition reached the river in fair shape, that would be of great use to Stephens, such as cooking utensils, clothing, blankets, etc. I felt, therefore, that no stone should be left unturned to get all of these to the river. Barring accidents, I believed that the men had a fair chance of pulling through.

Heavy clouds had been hovering in the direction of the Tanana; but about 3 o'clock they lifted for ten minutes, and the sun shining on snow-covered Mount Sanford, 150 miles away, made the members of the expedition forget for a moment the condition of affairs. It was an impressive spectacle.

September 10 the expedition went over the divide, traveling N. 75° E., and at 1½ miles crossed a small stream running N. 20° E. This stream afterwards proved to be Sixty-Mile River, so the party were endeavoring to go south to hunt what was to their north; thanks to the map. One and a half miles along the side of the mountain the course changed to N. 40° E., which was followed 1 mile. The ground was covered with moss, but it was not difficult traveling. From here the expedition followed down the creek N. 70° E. 2 miles and went into camp, with plenty of wood and grass, at an elevation of 3,000 feet. According to the map this must be Miller Creek.

The expedition followed down the stream September 11 1½ miles, finding many signs of Indian camps on the way. These were evidently hunting grounds used by Indians living on Lower Sixty-Mile, but the members of the expedition thought they indicated that the mouth of Miller Creek was not far distant. The expedition now traveled east 4 miles, going through birch woods wherever possible, as they always assured a hard and open trail. The expedition had dropped below the timber line and the surrounding mountains were covered with

a dense growth of spruce. The horses were showing plainly the effects of the struggle, and on going into camp everything was cached that could be spared, which lightened the load considerably.

September 12 the expedition followed up a branch of the creek on which it was camped 1 mile north, then N. 5° W. 1 mile, then N. 10° E. 2 miles, N. 35° E. 1½ miles, and camped well up toward the source of the stream. After traveling through a cold rain and the expedition unpacked, the hands of my party were so numb that it was hard to handle the ropes, and it took three times the ordinary time required to get camp into shape. The camp was in good grass on the edge of the timber line, and the bald mountains were covered with a coating of snow that reached almost down to it. Things were beginning to look squally. Snow was on the mountains, the nights growing colder, the days perceptively shorter, summer clothing proving too thin to protect the bodies of the men, horses growing weaker daily, and no signs of Miller Creek. I determined to make a break for Forty-Mile, but to do so necessitated crossing over into the next valley to avoid some very high mountains. To be sure that my prismatic compass was working right and not being affected by local attraction, I would line up on Polaris whenever it was visible by sighting over the top of a tree and then planting a stake. In the morning the compass sighted over the same line gave me the variation.

The following day, September 13, a climb was made to the bald ridge N. 30° W. half a mile, but it was too foggy to see the surrounding country, and I was compelled to be content with half-mile sights. The courses along the ridge were as follows: N. 15° W., N. 10° E., N. 20° W., N. 5° W., N. 8° E., and N. 20° W. Here we came to the end of the ridge, and it was necessary to wait for a view of the surrounding country, so as to determine what next to do. The fog finally lifted, and I was able to pick out a camping place 1½ miles away at N. 60° W. and to outline a course for the next day.

September 14 we toiled 1½ miles to the top of a ridge over a firm but abrupt trail, then 1 mile over the highest point at S. 40° W. During this mile one of the horses lay down several times, and his load had to be removed and distributed among those carrying the lightest weight. From the summit, looking off northeast, I made out what appeared to be a tent

about 10 miles down, and on the left bank of what I thought must be a large stream, judging by the valley and the country drained. After moving 1½ miles down a branch of this stream at N. 80° W., camp was made, in scrub timber and good grass. A quarter of a mile before going into camp the horse again lay down, although he had only his saddle to carry.

Ptarmigan are to be found on all of these bald mountains.

After following down the branch 1½ miles on September 15 we crossed the main stream. It was 20 feet wide and fordable in most places; clear, tortuous, and swift, with a good gravel bottom. The banks are, as a rule, fairly low, and it runs through a valley varying from 1 to 2 miles in width, with high mountains on both sides. Following downstream with much difficulty 3 miles at N. 15° E., we camped on the right bank, in heavy timber and good grass. The banks gave evidence of frequent high water, and it was plainly evident that camp at this point would have been untenable a month earlier. Two miles before going into camp the weak horse played out completely and was abandoned. On the way a number of saw pits were observed, which was very gratifying, as it showed that timber had been sawed here, and, there being no houses in sight, it was natural to suppose that the lumber had been floated downstream to be used in building a settlement. The direction, N. 15° E., was just what I wanted, and as long as the stream so continued it could be followed. But from the high mountain I had observed that it made an abrubt turn to the right farther down, and was on the lookout for a favorable opportunity to leave it and go more to the left.

After 4 miles of floundering in the valley and on the mountain sides, the horses falling and struggling, we camped, September 16, on the right bank of the stream, in a spot similar to the last camp. When dinner had been eaten, I sent Gumaer to the mountain on the right of the valley to see what he could discover in the shape of a good place to leave the stream and break off to the left. About an hour after dark Gumaer returned with the information that the expedition was on Sixty-Mile River. This was a knock-out blow to every member of the expedition, and they could hardly believe it. Maps were at once referred to, but they were as stupid and misleading as ever, and it was not until several days later that the matter was cleared up. Gumaer had started for the mountains as directed, but upon catching sight of the canvas which

I had observed from the ridge made for it. He found it to be the roof of a sort of storehouse. There were a number of cabins and a store containing many articles that had evidently not been used for some time. Judging from things scattered about and the appearance of the banks of the creek, Gumaer thought there must have been a flood, and that the people had abandoned their houses in haste. The expedition found out afterwards that Alex. McDonald and a few others had pulled out for the Klondike in a hurry on hearing of the "strike." They struck it rich there to a man. On the door of the store was an official notice, which showed by its contents that this was Miller Creek. It was too late for Gumaer to go farther up the creek to look for inhabitants.

September 17 the animals had been having a trying time of it struggling along the river banks, but Stephens hit upon a plan that the expedition was sorry had not presented itself before. The train was formed in one string, with Stephens riding the lead horse and following down the bed of the stream, crossing and recrossing to keep in the shallow parts. One mile down quarters were taken up in the abandoned store, where a stove and plenty of split wood was found. The grass here seemed to satisfy the horses. It was a happy party that gathered around the stove after supper, smoking and feeling comfortable for the first time, and with spring bunks to crawl into when ready to go to sleep. The comforts of the house were all the more appreciated on account of the heavy rain outside, which turned to snow during the night.

September 18 was spent in giving the stock a much-needed rest and keeping the wash tub going, in addition to looking up the inhabitants, if any there were, in order to get information. After examining nearly all of the thirty-odd houses that composed the village, Gumaer and Cornwell found one with three men living in it, who informed them that it was 30 miles to the mouth of Moose Creek, on Forty-Mile, with a good, hard trail if the snow was not too deep. The mountains to be crossed were about 4,500 feet high, at the time snow-covered, and I considered that it would not do to run any unnecessary risk at this stage, so one of the men was employed to go with the party as guide next day.

All the coffee was ground so as to lighten the packs by discarding the coffee mill, and the gold pan in which the expedition had been mixing dough was exchanged for a wash basin,

which was much lighter. Many articles were thrown away, leaving between 600 and 700 pounds for the horses. There were six men living here, and I inferred from their conversation that the mines were paying fairly well, although nothing extra.

September 19 the weight was distributed principally among six horses, two of the remaining ones carrying only their saddles, and the third a very light pack. The expedition followed up Miller Creek due west 4 miles, then up the mountain and along the bald divide N. 5° W. 5 miles to the head of Glacier Creek, which runs parallel to Miller Creek and empties into Sixty-Mile. Several paying claims are reported in operation on this stream. The expedition was compelled to go ahead and break trail, for the horses were in snow knee-deep, and sometimes deeper. To make matters worse, the snowstorm was against the party. One of the horses gave out and his pack was placed by the side of the trail. He was then left with his back to the wind. Under ordinary circumstances I should have shot him, but the grass in the valley would sustain him for sometime, and it would be a pity to deprive the prospectors of a chance for fresh meat, which is so scarce, and scurvy staring them in the face. To waste anything eatable in this country would be an act of cruelty.

The course of the expedition to the mouth of Moose Creek was N. 60° W., and runs along the ridge of a divide between Moose Creek and Smith Creek. Half a mile from where the horse was left another gave out and received the same treatment. The snow was now getting much deeper, and 1 mile farther on another horse was abandoned. It ceased snowing and a heavy fog came on. The expedition got down into a small valley 15 miles from Miller Creek and camped, in good timber and grass with only an inch of snow on the ground. The elevation at this point is 2,900 feet.

September 20, 2 miles from camp, a horse gave out as a result of the previous day's hard struggle and was abandoned. Six miles farther the expedition climbed a high point of mountain, and from here the descent of 7 miles to the boundary mark where the party entered United States territory was steady and rapid. Scrambling down a very steep mountain side and traveling 1 mile, the expedition crossed to the right bank of Moose Creek and camped at its mouth, 1 mile farther

on, with the remaining five horses in fair condition, although their ribs were showing plainly.

If I could have started two weeks earlier, the mouth of Forty Mile could have been reached without the loss of an animal, and if the expedition had had a pack train when it landed at Valdez, April 19, supplies could have been sledded over the glacier, a base established in the interior, and the country explored in all directions by a party going through to Circle City and Eagle. As it was, I was compelled to traverse the country in a bee line, not even having time to hunt. I am glad to say that my party came through in the best of health, and that the mouth of Moose Creek was reached with a good supply of provisions on hand. The expedition walked all the way, and, but for the mosquitoes and gnats and the fact that it was running too close to winter in a cold and unknown country, I should have considered the ground covered a good-sized practice march, although by no means a picnic.

Camp was made in a small flat, with good timber, grass, and mountains on all sides. There were two cabins, both occupied, and a number of people encamped on their way up and down stream. I rigged a small pole and hoisted the American flag for the first time. Almost immediately a faint cheer came from a tent on the opposite bank, and well above the expedition, and up went a little flag that appeared at a distance to be no larger than a postage stamp.

Some men coming in from Glacier Creek informed me that they had passed two dead horses on the way, but had not seen any others. I concluded from this information that two out of the four abandoned horses had made their way to grass. The mouth of Moose Creek is 26 miles from the Yukon, with an elevation of 1,800 feet, and these 26 miles of Forty-Mile River are a stretch of tortuous canyon with picturesque, sloping sides. The horses of the expedition were practically in a pocket, as there was no trail either up or down stream, and to attempt Dawson or Forty-Mile Post by the ordinarily good trails over the snow-covered divides would mean certain death to them. Stephens wished to remain in the country, so I left him, with as much food as could be spared, and requested that he do everything in his power to pull the animals through the winter. I believe that he has a fighting chance to pull some of them through if he can

manage to get them to Forty-Mile alive. I am glad that Stephens chose to remain, for I feel sure that if anyone can save the animals it is he. He was my mainstay during the trip where horses were concerned, and was always skillful, patient, and loyal.

September 21 a boat was purchased and the expedition went down the river, the first 3 miles being on American soil. The party lined down one rapid, shot another, and landed at Forty-Mile six hours after starting. On the way many boats were met with winter supplies, being lined up by prospectors; others were waiting for the river to freeze, so as to haul their supplies up with dog teams. Some people make it a business to supply mining camps during the winter at a heavy rate per pound, using dogs. I noticed that all the boats were numbered, and found that the Northwest mounted police numbered them as they came down the Yukon, one of their reasons being the identification of occupants in case of a boat being found bottom side up.

Forty-Mile is a large cabin village, with a trading store and warehouse, and is on the right bank of the river where it empties into the Yukon. Just across the stream, which at this point is 100 yards wide, is another trading post and Fort Cudahy, a station of the mounted police. The Yukon is 300 yards wide, of good depth, and clear and swift. The elevation here is 1,450 feet.

It was too late to catch the last boat for St. Michaels, September 25, and the expedition's only hope lay in getting up the Yukon. Seeing two boats land, which were pushing a barge at Fort Cudahy, the members of the expedition lost no time in tossing their outfit into a skiff and rowing down to them. American boats are not allowed to carry passengers from one Canadian port to another, but Lieutenant Scarth, of the mounted police, had given instructions that my detachment should be taken aboard. The boats were the *Governor Pingree* and *Philip B. Low*, and were pushing the barge *New York*, loaded with supplies for the Canadian troops at Fort Selkirk.

The expedition landed in Dawson the evening of September 26. This city is hard to describe. The big companies have fine, large warehouses, and there are many good buildings and others in course of construction. The side of the mountain just back of the city was dotted with tents. A good

meal can be had for a dollar and a half, and lodging in proportion. It is impossible to get liquor on Sunday, the closing law being rigidly enforced. But what impressed me most of all was the orderly conduct of the inhabitants. This discipline is due to the excellent management of the mounted police, which is as fine a body of men as I ever saw. The commanding officer is chief magistrate. The post office is the only bad feature. I saw 200 men in line, and it did not appear to move forward very rapidly. In cold weather this would prove a hard proposition. Money is very little used. Most places have gold scales, the payment being in gold dust, of which there appears to be an unlimited supply.

Everyone was glad to see the United States uniform, many of them saying, "I don't know who you are, but I want to shake hands with you. It does me good to see the uniform again." The result of Dewey's victory was received just before the Fourth of July, and the commanding officer gave the Americans the freedom of the city on that day, and they evidently made the most of it. There was a wild celebration, but no Americans were arrested.

A couple of very pleasant days were spent with United States Consul McCook. In looking over Schwatka's report I found that his thirty-second camp was where Dawson now stands, and that he called the Klondike "Deer Creek." Typhoid pneumonia has occasioned many deaths here.

The *W. K. Mercinx*, drawing 4½ feet, probably the deepest draft of any steamer on the upper river, appeared to be the only transportation available. The river is shallow in places, and the expedition was rather doubtful as to the result of the venture.

September 29 the party tied up for the night near the mouth of Indian River, the channel above being considered risky. In summer boats run all night, as it is daylight most of the time.

The following day, September 30, a stop was made opposite the mouth of Sixty-Mile River, at a police post, to take on wood. The mounted police have posts manned by two or more men every 30 miles from Dawson to the summit of the Skagway trail. At Sixty-Mile is a good-sized store, and the people located there were digging up potatoes, parsnips, and turnips. They also raise lettuce, radishes, onions, etc. The turnips caused the death of John Graeber, one of the passengers

and a typhoid convalescent, who gorged himself with them. The next tie-up was just above White River. The Yukon from here up is very clear, and from Forty-Mile to the head of Lake Bennett picturesque mountains, covered with fine timber, skirt the water.

October 1 we tied up 60 miles below Fort Selkirk, and on the day following tied up within 6 miles of Selkirk. A stop of one hour was made at Selkirk. The barracks are on an excellent site on the left bank of the Yukon, opposite the mouth of the Pelly River, above which the expedition was glad to get. The ice comes into the Yukon from the Pelly until the latter is blocked, when the Yukon is free again and does not block until much later. The source of the Pelly is far up north. I understand that the town site of Eagle, which is on the bank of the Yukon below Dawson, and just across the line, is not unlike the Selkirk site. Selkirk is one of the most important posts in the Territory. The expedition saw about fifty Indians that resembled very much the Indians of the interior, but they did not appear to be so good-natured and kindly.

During the night, at a point 13 miles above Selkirk, Graeber died, the cause of which has already been stated. From the mouth of the Pelly the Yukon becomes the Lewis River.

October 4 the expedition tied up 25 miles above Selkirk, at an Indian camp. These natives live at Selkirk, but were here waiting for the moose to come down. The day following Graeber was buried on the right bank of the river, at the first police station below Rink Rapids.

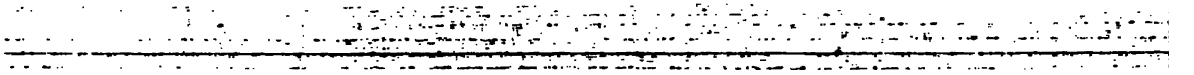
In attempting the rapids the expedition, on October 6, was grounded, and remained the 7th and 8th trying to work their way off. The boat was gotten off once, but grounded again, staving a hole in her bottom, which was with much difficulty patched up. It began to look as if the steamer would have to make a winter of it, and I made arrangements with a sergeant of police, who was building a cabin just above the rapids, to take the expedition down to Selkirk or Dawson in his canoe, if it became necessary. The party was not prepared for the winter, and it would have been next to impossible to get through safely, clothed as they were. October 9 a dead man was buried, and, by using steam and a capstan, the expedition lined up the rapids and rounded the point.

After steaming to Five Finger Rapids three attempts wer made to get up, but the wheel sank too deeply into the wate and lost its power, and the expedition was compelled to ti up for the night just below. October 10 a rope was carrie by hand and attached to a tree above the rapids, one end o a small rope being attached to a log, which floated down an was picked up below. The large rope was then hauled in and used on the capstan. After an exciting struggle—th boat at times standing still, and every moment we expectin to go backward—she managed to squirm through. A tie-u was made 28 miles below the mouth of Little Salmon River.

On the way up many scows were met loaded with dressed cattle, sheep, and hogs, and occasionally one transportin live stock. Most of the stock had been driven over th Dalton trail and butchered on the bank of the Yukon, within a few miles of Rink Rapids; but some had been driven ove the Skagway trail. October 11 the steamer tied up 3 mile above the mouth of Little Salmon, and the day following tied up again at the police station just above the mouth of Big Salmon. October 13 the expedition found itself tied up 2 miles above the mouth of the Hootalinqua. From the mouth of this stream to Lake Labarge the river is known as Thirty-Mile and is very swift. October 14 the expedition went up Thirty-Mile, through Lake Labarge, up Fifty-Mile a short distance and tied up below White Horse Rapids. October 15 the expedition was portaged 5 miles to a station called Miles Canyon, sending the baggage over on a tramway of wooden rails. The rapids are three-eighths of a mile long and very dangerous, although there have been comparatively few accidents. The steamer *Nora* was boarded in the afternoon and started for the head of Lake Bennett, but came near having to shoot Miles Canyon and the rapids before getting under way. As the bow left the shore the wheel got tangled in a raft and could not revolve without tearing off the buckets. For the ship to float down as she was and land would be to tear her bottom off on the rocks. Her nose swung down with the current and was run into the opposite bank the moment she was free. She was tied up, given a chance to breathe, and started on her way again. Lake Marsh and Six-Mile River were passed and the boat tied up at an important police post on Tagish Lake.

October 16 the head of Lake Bennett was reached, which is a thriving village with many hotels and an important police station. The day following the expedition sent its baggage to White Pass by pack train and walked 8 miles over the Skagway trail to Log Cabin, a large village of cabins and tents. The trail was fair, although wet.

October 18 the expedition walked 20 miles to White Pass, which is quite a town, but will soon disappear, as the railroad is passing around it, and at several hundred feet greater elevation. The trail is rocky, muddy, rough, and about as bad as possible, and it is hard to distinguish the summit, as for several miles the high points are about the same elevation. The members of the expedition would occasionally step on dead horses and hogs. Some cattle, sheep, and horses, and, I judge, all the hogs had been driven over the trail and loaded on barges alive at Bennett to be butchered down the Yukon. Several pack trains were met that appeared to make good headway, although to go over the trail without falling required some care. I dread to think what effect a freeze without deep snow would have on travel. After 20 miles of stiff walking the expedition entered a canyon that surpassed for beauty and grandeur anything that had been seen. In the afternoon the members of the expedition boarded the narrow-gauge railroad and rode 12 miles into Skagway.



REPORT OF LIEUTENANT R. M. BROOKFIELD,

Second Infantry, U. S. A.

ACROSS VALDEZ GLACIER, AND SURVEY OF BATES PASS.

By way of introduction it should be stated that as it had been reported that there was a practicable summer route from Valdez to the Copper River over a glacier to the east, I was ordered to go over this glacier. This accomplished, I was expected to establish a camp on a lake which was said to be near the foot of the glacier on the other side. In pursuance to these instructions, I started on my expedition at 3 o'clock on the morning of May 21, with two enlisted men and several civilian packers. I reached the foot of the trail over the mountain in a little over an hour, a distance of 3⅓ miles. I took with me five sleds, carrying a load of 300 pounds each. At the foot of the mountain I found a small river, which caused me to consume nearly two hours in crossing. Here I was abandoned by all but three of the civilian packers, as it was found that the crust on the mountain would break through, even under a light load. I went forward with four sleds, loaded with 100 pounds each, and by 10 a. m. the two leading sleds had reached a point on the mountain 2½ miles from the foot. The altitude was found to be 750 feet. Here a cache was made, as it was found impossible to go farther. The mountain was yet covered with from 5 to 20 feet of snow, and as the crust softened travel became very difficult. On returning over the trail I found the other two sleds about halfway down, where they had been abandoned by the packers. That night I camped at the foot of the mountain. On account of the weather being warm and rainy, I decided to return to camp for instructions. The bad weather continued for several days. As the storm cleared on May 26, and colder weather made the formation of a crust probable, I again started with four enlisted men at 8.15 a. m.

My instructions now were to survey the trail as far as the summit of the glacier, and if possible to find out and report

upon the character of the country on the other side of the divide. The foot of the mountain was reached at 10 p. m. At this point the trail leads over a level plat for 3½ miles in a direction nearly east of the camp. At the base of the mountain were found several small encampments of prospectors who were waiting for the snow to leave before starting over the divide. Traveling on the mountain was again found to be difficult, and the cache was not reached until 3.10 a. m. on the 27th. Here the men breakfasted, and with Corporal Heiden and Private Gardner, of the Fourteenth Infantry, and Mr. Pope, I continued my journey. It was my intention to reach the summit of the pass, where it was expected that a comprehensive view could be had of the surrounding country. To provide against emergencies three days' provisions were taken, as well as the men's rifles, while I carried only my instruments and a pair of snowshoes. After several hours of laborious tramping the summit of the pass was reached at noon. All through the morning the men traveled through a storm of rain and sleet, which afterwards changed to snow, and which finally effectually prevented me from seeing anything of the country. However, I decided to keep on until I could find wood and water. At the summit the barometer showed 6,450 feet, and the distance from the foot of the mountain was estimated to be 7 miles. From the summit the trail leads down the glacier by several steep slopes. The slope of the glacier itself was gradual in the upper stretches, and the snowshoes, which up to this time had been useless, were used to excellent advantage. Two large feeders of the main glacier join it from the right and leave it at about 3 miles east of the summit. The one from the right is very precipitous, and is broken all the way up by perpendicular ledges of blue ice.

While coming up the mountain the soldiers shot a badger and a squirrel, and this game proved a very welcome addition to the limited fare of the party. A number of bear tracks were discovered, but no bear. The end of the glacier was reached at 8 o'clock that evening. Here the men met with an obstacle that for the time seemed insurmountable. The glacier appeared to be suddenly chopped off between two high, precipitous mountains, which, beyond the limits of the glacier, formed a narrow gorge. No footholds could be obtained, and the descent was finally made through a large crevasse which existed near the right-hand end of the glacier. The

light baggage which accompanied the men was thrown down ahead of them, while the men slid down the steeper slopes, trusting that the snow which had accumulated in the crevasse was strong enough to bear them. The bottom was finally reached without mishap after seven or eight hundred feet of this kind of descent. The bottom of the gorge was filled with large bowlders, and a considerable stream ran through it from the rapidly melting snow on the glacier. The route followed was not practicable for any kind of travel, but a practicable route is said to exist about a mile and a half from the foot of the glacier.

Following the glacial stream through the gorge the expedition soon came to a wooded valley about 4 miles long and three-quarters of a mile to a mile wide, running northeast, and inclosed by high mountains. No lake was visible, and instead of finding the stream in the valley running east, or northeast toward the Copper River, it was found running to the south, thus leading to the conclusion that the divide had not been crossed, and that the large stream flowing through the valley was but a continuation of the river flowing into Port Valdez at its southeastern extremity. Camp was not established until 2 a. m., and the men had been forty-three hours without sleep. It rained continuously from May 28 until May 30.

May 29 the expedition started to explore the valley. After traversing it a short distance the members of the expedition were informed that the river was frozen over in the canyon, which latter was reported to be 5 miles long. It was further reported that the ice had broken up in the canyon. Mr. Lewis and I proceeded to the southern end of the valley with the intention of exploring the canyon, but found passage through it impossible. To the west of the canyon was a large mountain about 7,000 feet high, and at the beginning of the canyon was an immense snowslide, which extended almost to the southern extremity of the mountain. The slide had covered the entire valley at that point at one time, crossing the river and extending up the mountain on the east. In fact, the river passed between perpendicular walls of packed snow about 50 feet high even then. The expedition climbed some distance up this snowslide and on the mountain in the endeavor to get a good view of the canyon. On account of the soft snow this plan was abandoned. The mountains on each side of the

canyon appear to be continuous, as far as the men could see. The compass bearing down the canyon was 200°, and that up the valley 320°. The current in the river between camp and the canyon was very swift, with several rapids. There were several subdivisions of the stream running through the valley, and all had the same general character, very swift, and with a bed of large bowlders. The whole bottom of the valley was composed of coarse gravel and sand, with large bowlders running through it.

There was considerable cottonwood and pine found in the valley, especially near the upper end, where the timber appeared to be excellent. On the lower slopes of the mountains there was also pine. During the stay at this point, from the 29th to the 31st, the men of the expedition managed to get rations from prospectors, and also managed to find several porcupines, which helped them to patch out their food.

On May 31 the expedition divided up into three parties. At that time the glacial stream, which had been followed through the gorge from the glacier, had increased very greatly in volume. A decided thaw had also set in, which rendered travel on the glacier almost impossible without snowshoes. Therefore it was decided that it would be less hazardous if an attempt was made to raft down the river. With this in view a good, strong raft was constructed, while in the meantime the remainder of the party was started to explore the country to the north and northeast, through the Copper River. The valley was found to be, in general, three-quarters of a mile wide, and the head of the valley to be 4 miles from camp. Here the expedition separated—Lewis and Fleming going over the foothills to the north, while Corporal Heiden and I attempted to follow the river. Another canyon commenced at the head of the valley, and it was found impossible to follow the river. As it became apparent that the Copper River could not be reached, the party decided to return, and spent the night at the head of the valley. The barometer reading at this point was 800 feet; thermometer, 65°. Several glacial streams enter into the river in the valley. These streams were increasing rapidly in volume at the time named, and carried a considerable amount of water. The main stream was a raging torrent, which it was impossible to ford, and this prevented me from exploring the country to the east. In every direction were mountains as far as could be seen. One day

later Lewis and Fleming returned to camp, and reported that there was not a great extent of timber on the left-hand side of the mountain, and that they had gotten through and found the country beyond to be a gradual ascent and easy traveling. They also reported a stream flowing to the northeast, and from their report at this time, as well as from a report of a subsequent journey by Dr. Lewis, a long distance down this stream, where it had reached the proportions of a river, I judged this body of water to be the Konsena, and have so shown it on my map.

The glacier at the head of the Konsena was crossed by Dr. Lewis, and he reported it very good traveling and a thoroughly practicable route. The country at the head of the Konsena was reported as being a small plateau covered with moss and large stones, and broken here by small buttes. The valley of the Konsena was in general about half a mile wide, open, with very little timber, a gradual descent, and the traveling good. The raft being completed on June 3, a start was made down the river. The current was swifter than anticipated, and the raft was whirled and tossed about. Guiding poles were of no use in this swift current. The rapids were safely passed through, however, at the lower end of the valley, but once in the canyon the current would sweep the raft against the rocks, first one side and then on the other, when the raft would frequently be almost overturned. The railing which had been constructed on two sides of the raft was thrown off by the rocks almost at the beginning of the journey. The walls of the canyon were very precipitous, and on one side or the other would generally be perpendicular to a height of 100 to 700 or 800 feet. At one place in the canyon the raft was stranded on a sand bar. Later on it struck a large submerged rock in midstream, where, under the strain of the rushing water and the combined weight upon it, the heavy cross-logs snapped in two. Half of the raft held together, and after a time the men were successful in getting this portion of it off. Finally, however, the weight was too great, and, as the raft commenced to sink, Heiden jumped for the rocks as the logs were being swept near the right-hand side. Now the remaining portion of the raft turned bottom up, throwing everyone into the water but myself. Pope was carried away from the raft. He succeeded, however, in getting on the raft again,

when almost immediately afterwards another rock was encountered, where the raft remained fast. Gardner had already jumped for the rocks on the left, and by his help the members of the expedition were able to get across safely to the rocky beach on that side. All of the men were wet to the skin and chilled with the ice-cold water. We finally extricated ourselves from the canyon by a steep snowslide, which had come down to the water's edge at the lower end of the beach. The height of this slide was 800 feet. The mountain on the left was broken at frequent intervals by draws with perpendicular slides, and we were compelled to go up to the snow line to get around them. When the canyon was finally abandoned the members of the expedition were within a mile of the southern end, where it opened into the head of the wide flat extending all the way to Port Valdez. The total length of the canyon was 4 miles, and its general direction 200°.

After reaching the upper end of the flat the river was found to be divided and subdivided many times, and by fording to the right wherever possible the members of the expedition were eventually able to cross the river. The head of the flat was 14 miles from Port Valdez, and its general features are illustrated on the map. The traveling at first was over gravel creek bottom and was very good; but at 5 miles from the canyon heavy timber and swamps commenced, which it was hard to get through. Following this came foothills covered with soft snow, and subsequently the small lake shown on the map. Valdez was reached at 3 p. m. on June 4, after a walk of twenty-three hours without food or sleep. The other members of the party all returned safely at various times.

In the months of February, March, and April, 1898, it was estimated that 3,000 people had landed at Port Valdez, Alaska. All of these people were prospectors, who were bound for the head waters of Copper River and its tributary streams. Of those who had remained in the newly-founded town of Valdez, some were merchants who had opened stores there, while others were prospectors who were waiting until the snow left; then they intended to either prospect along the coast or take the summer trail into the interior. The only practicable winter route across the mountains then discovered led across the large glacier at the head of Port Valdez, Alaska, and this route had been taken by the 2,500 people who had attempted to reach the interior. Up to the middle

of April the leading parties had not progressed beyond the summit of the glacier, and there was considerable doubt among them as to the route to be taken to reach the Copper River. It was with the view of quickly determining the proper trail and mapping the route that I undertook the enterprise under the direction of Captain Abercrombie.

Accompanied by Mr. F. C. Schrader, of the United States Geological Survey, on April 26, I started to make a survey of the route mentioned. I left camp at Valdez at 9.30 a. m. We took with us one sled, with a load of about 300 pounds, consisting of our bedding rolls, a few articles of extra clothing, a shelter tent, snowshoes, an oil stove, a few cooking utensils, and provisions for a two weeks' trip. Our instruments we carried about us. The average depth of snow at this time was about 6 feet, but the sledding was comparatively good, as the trail to the glacier was well worn and the snow had packed from constant travel, while the nights, as a rule, had been cold enough to freeze the upper layers of snow into a solid crust. A little earlier in the season this crust was constantly present, and traveling at that time was reported to be excellent. Animals of all kinds were used to great advantage when the trail was frozen. At the time of our arrival here horses and mules were selling at from $300 to $450 apiece. A horse costing $15 in Seattle would readily bring $300 here, and, if used for freighting, would earn the latter sum for his owner in three or four days. Mules were more valuable still, and few could be bought at any price. A number of burros were also used, but these were not found to be as serviceable as horses and mules. Dogs had been used very extensively, and had given valuable aid. A large-sized, well-fed animal of the Newfoundland or St. Bernard species will pull as large a load as a man, and will do fully as much work in a day; and they have the great advantage of being able to work in a soft trail, which would break through under any other animal.

The trail to the foot of the glacier leads in nearly a straight line from the beach at Valdez across the large flat which bounds the bay at the eastern end. This flat is 6 miles wide, and in general about 4 miles across from the beach to the mountain to the east. The rise is very gradual, and at the foot of the glacier we found the elevation to be only 150 feet, while the distance by the trail from the beach was 4¼ miles.

Arriving at this point at noon, we found there an encampmen of from 300 to 400 people. This is at the foot of what is know as the first bench, which is an incline of about 22 degrees an 50 feet rise, the top of the bench extending for a mile, with gradual grade to the foot of the second bench.

We reached the top of the first bench by the aid of a bloc and fall, the use of which was kindly offered to us by th owner, who was then operating it. About six men are neces sary to drag up a load of 300 pounds even by this means, an we paid for the extra help we received by assisting others The second bench may be climbed in the same manner as th first, or the sleds may be drawn up a semicircular pass on th side of the glacier. The latter trail, while involving consid erable extra labor, was very generally preferred, as it wa from 50 to 75 yards away from the side of the mountain to th east, while the lower trail ran along the bottom of a smal ravine formed by the side of the mountain and the side of th glacier, and there was great danger in this part of the trai from snowslides. That the apprehension on this score wa not unfounded was proved some four days later, when sev eral successive slides covered the whole bottom of the ravin in this vicinity to an average depth of 30 feet.

From the top of the second bench a comparative level of 20 yards brings you to the foot of the third. The latter start in with three sharp pitches, each with a grade of 15 degree and a height of about 60 feet. These are also ascended by the aid of a block and fall. At 4.30 p. m. we had reached th top of the second of these pitches, a distance from the beac of about 6¼ miles, and there we decided to camp for the night The wind, which heretofore had been light and from the west, had by this time veered around to the south, and in a short time we had a heavy fall of wet snow. A southerly wind invariably means wet weather, as the large amount of mois ture brought with it from the North Pacific is condensed by the cold of the glaciers and falls as snow or rain, according t the altitude and the season of the year. The storm continued intermittently throughout the night of the 26th, and the next morning the trail was soft and wet and but little progress could be made, and that only by great exertion.

The start on the 27th was not made until 10 o'clock, as the mountains before that time had been obscured by fog and falling snow, which rendered topographical work impossible.

At 10 o'clock the weather cleared somewhat and we decided to push on, but we were able to make only a mile and a half that morning as the result of three hours' hard pulling. By noon the condition of the trail had become so bad that all work on the glacier was effectually stopped. Soon after this it began to snow vigorously, and as there was a steady southerly wind that gave no promise of an early termination of the storm, we decided to cache our outfit and return to camp at Valdez until the weather cleared sufficiently to enable us to continue our work. We reached our camp in two hours. Learning here that the leading prospectors had found the right trail to the Copper River, it was decided that on our return to the glacier we should leave our outfit at the cache and survey the trail as far as the summit of the pass and then return to the cache, and later explore a glacier to the south with the view of finding a shorter and better trail.

April 28, 29, and 30 the storm continued without intermission. The fall of snow for the four days was over 60 inches.

On May 1 the snow gave place to a warm rain, which settled the snow to nearly its former level and packed it to a considerable extent, so that when the storm lifted later that night the cold weather made it possible to make fair progress over the trail. A start was again made on the morning of May 2. When passing the second bench we found that even the upper trail had been covered to a considerable extent in places by the snowslides of the 29th and 30th, and a number of men were then burrowing in the snow in an endeavor to find their buried caches. The first of these slides occurred on the evening of the 29th, and, extending over to the trail on the side of the glacier, buried six men who had camped there at the beginning of the storm, together with some twenty-five burros which they employed in freighting. The men were all taken out alive, suffering severe bruises, but the burros were less fortunate, ten being killed and the remainder badly used up. The whole of that day, and in fact all during the preceding storm, snowslides were constantly occurring. The mountains being very precipitous and covered with loose bowlders, every slide would bring with it a large quantity of rock, causing a roar which, in the case of a large slide, could be heard for 5 or 6 miles.

At the top of the third bench the altitude was found to 800 feet, and the distance from the foot of the first bench miles, making an average grade of about one in twelve f this distance. From the top of the bench a deep narr canyon opens out to the right, the general direction of whi is N. 25° E., magnetic reading. The canyon has a steep gra and carries a small dead glacier. On reaching our cache v found that we were at the beginning of a long encampme along the trail, the extent of which we had not been able see when making the cache on account of the storm. The encampments were a common feature on the glacier. W found that prospectors as a rule carried with them an outf averaging 1,500 pounds per man. Few prospectors were pr vided with pack animals, and, as a good load for a man c even the gradual slopes of the glacier is only 150 pounds, a outfit of 1,500 pounds would necessitate ten trips, loaded, ov the same ground. We found that the best progress was mad by those who made trips not longer than 2½ miles. Havin the camp at one end and the cache at the other, the best worke would make on a fair working day, or rather night—for th is usually the best time for working on the glacier—five trip carrying 150 pounds each trip, for 2½ miles. Progress ov the benches is necessarily much slower, but on the average good worker could make the 23 miles from the bench to th summit with 1,500 pounds in eighteen days, provided he ha good working weather.

The glacier presents some special difficulties which may b mentioned here. Warm, nourishing food and good drinkin water are of first importance, and both involve the use c some kind of fuel. A good oil stove has been found to b the best solution of this problem. Toward the latter part c April, after the snow has begun to melt, water may be obtaine near the foot of the glacier, but after leaving this there is n water for 27 miles, and it is necessary to melt either snow o ice. The nearest dry wood is 1½ miles from the foot of th glacier, and for those who are not provided with oil stoves great amount of extra labor must necessarily be expended i hauling wood. At the summit of the glacier wood sold fo 20 cents a pound, a small piece of dry cottonwood a foot lon and eight inches in diameter readily bringing $1.

For half a mile along the second bench, and for three fourths of a mile before reaching the summit, snowslides ar

a source of considerable danger during and just after a storm, and a camp or cache should not be made at these places. Sudden changes of temperature are apt to occur. An icy wind will sometimes start from the upper glacier and cause a change of temperature in a few minutes of 20 to 30 degrees, and if not provided with extra clothing for such an emergency a chill is more than probable, and this may result in pneumonia. Snow-blindness is very common on the glacier. Besides the pain and the possibility of a permanent injury to the eyes, it involves loss of time, as it is necessary to keep the eyes closed for a brief period. It generally takes three or four days to effect a cure, and then there is considerable liability to a recurrence if care is not taken to keep the eyes well shaded. Snow glasses should be worn constantly while on the glacier. I have seen a pair of very inferior smoked glasses sell for $5.

Crevasses must be guarded against as soon as the snow begins to melt on the lower glacier. At the present time no crevasses were open across the trail, but in several instances several narrow crevasses have opened a few feet away from the trail, near the foot of the glacier. These crevasses extend clear through to the bottom of the glacier, as on dropping stones into them the splash into the glacial river was distinctly audible at the end of the fall.

From the encampment, a mile and a half from the top of the third bench, the trail leads a gradual grade halfway across the glacier in a northwesterly direction for 1½ miles, thence to the north for nearly 2 miles to what is known as "Five-Mile camp," so named from its estimated distance from the top of the third bench. Here we found about 300 people. The average width of the glacier from the foot to a point 3 miles above Five-Mile camp is 1½ miles, but at the latter point the glacier narrows to 1 mile, being forced between the high mountain on the east and a sharp projecting spur of the mountain on the west. This causes the ice mass on the west to crumple up into a series of perpendicular ice ledges, the clear blue ice of which is visible at a distance of 5 miles.

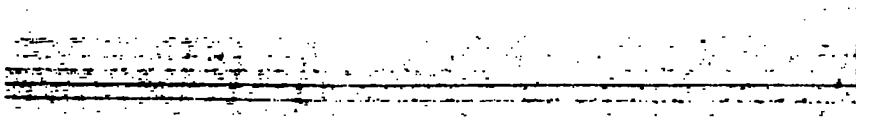
Opening out to the east between Five-Mile camp and the ice ledge is a large canyon, the mouth of which is 2½ miles wide. This canyon contained at one time a large feeder of the main glacier, but at the present time the canyon glacier is separate and is apparently receding, the foot of the latter

being about 2 miles to the east of the trail. From the ic ledge the trail leads northwest for 1¼ miles to the foot of th fourth bench, where we found an encampment of about 35 people. Here we learned that the trail was not broken throug to the summit, and, it being 8 o'clock in the evening, we de cided to spend the night there. At this time of the year ther is very little night, as it does not get dark until nearly 1 o'clock, while it commences to get light by 2 o'clock. Durin a storm it was the custom to keep traveling over the trail wit empty sleds in order to keep the trail open, but the stor which commenced on April 27 was so severe that this wa soon given up, and all spare energy was given to keeping ten and goods from being snowed under. Near the summit o the glacier it was reported that over 10 feet of snow fell du ing the five days' storm.

Leaving camp at 4 a. m. May 3, we again started up th glacier. Early that morning a new trail had been broken b a working party coming through from the summit, som going in advance with snowshoes, while others followed wit shovels or light sleds, packing down the snow. The fourt bench is a slope averaging 10 degrees for a quarter of a mil and then a gradual, steady rise for 5 miles, in a direction a little to the west of true north, to the foot of the summit At the latter place there was a camp of fully 400 people From the fourth bench the glacier widens out until at th foot of the summit it forms a large bay of ice extending down some 3 or 4 miles to the westward. Here the elevation was found to be 3,900 feet. The distance from this point to the summit is three-fourths of a mile, and the angle of slope nearly 17 degrees. The altitude of the summit is nearly 4,900 feet. On the second night before we reached the summit there had been a heavy snow slide from the moun- tain to the right which had buried some twenty-five or thirty people who were encamped along the trail. These were loca- ted by their cries, which could be plainly heard through the snow, and all but two were taken out alive. A num- ber of caches were covered to a depth of from 15 to 25 feet, and few of these were ever found, as the goods had been swept away in the slide. At the summit the air was much lighter than at the foot of the glacier, and it was also much colder. The distance from Port Valdez to the summit by the present trail was found to be 23 miles. Having

reached this point, sledding down to the Copper River is a comparatively easy matter as long as the weather remains cold enough to form a crust on the snow. We found that prospectors loaded their sleds with as much as they could carry, occasionally as high as 1,000 pounds, for the trip down on the other side of the glacier. Just beyond the summit we found a camp of about 300 people. On this side the glacier averages 1 mile in width and it extends with a gradual grade for 6 miles in a general direction N. 12° W., magnetic reading. The mountain ranges on either side are unbroken for this distance, and are between 4,000 and 5,000 feet high.

Being the first Army officer to go over the glacier, and the pass being yet unnamed, I was given that privilege, and accordingly named it Bates Pass, after that most excellent and esteemed soldier, Brigadier General Bates, United States Volunteers, and formerly colonel of the Second United States Infantry.



REPORT OF LIEUTENANT GUY H. PRESTON,

Ninth Cavalry, U. S. A.

ACROSS THE VALDEZ GLACIER WITH SLEDS DRAWN BY HAND.

Under the orders of Capt. W. R. Abercrombie, on April 25, 1898, I organized an expedition to sled by hand across Valdez Glacier, the object being to place a cache as far up Copper River as possible. I took with me thirteen men and seven sleds, with two men to a sled. Each man was allowed 40 pounds of bedding and changes of foot-gear. Each sled was loaded with a total weight of 300 pounds.

Setting out April 26, we gained the top of the second bench of the glacier, but not without great labor. When we reached the top all of us were completely exhausted. We bivouacked in the snow, using an oil stove for cooking and melting snow. Fuel and water was not otherwise obtainable anywhere on the glacier except by packing wood from the beach. April 27 we set out along trail, hoping to reach the summit. Arriving at Five-Mile camp in a snowstorm, I found the trail beyond obliterated. I changed my plans at once to meet this condition, knowing that the trail might not again be open for several days. Not wishing to camp for that period and consume rations which had cost so much labor to transport, we made back to the beach, a distance which I estimated at 11 miles, caching the provisions at Five-Mile camp. I then recommended to Captain Abercrombie that upon setting out again I should advance into the country after the manner of prospectors, with a small party, sending back several men from the summit as soon as I should have attained that point with my cache. I also proposed that upon setting out again I should take additional supplies.

April 28 I completed preparations for my second departure. Warm rain continued upon the beach and a blizzard prevailed upon the glacier. April 28 the storm on the beach turned to snow, with very heavy fog. The trail was deserted and was

impassable by anybody. April 30, 30 inches of snow had fallen, and it still continued heavy and wet. Everybody was waiting to move, because they were alarmed and fearful that the glacier trail would be cut off for the summer. May 1 the storm continued, changing to rain.

At 9.30 a. m. May 1 the sky cleared. Prospectors upon the beach set out and broke trail. I followed at once with eleven men and five sleds, arriving at our cache at Five-Mile camp with the additional load. I found the trail on the lower benches rapidly disintegrating. At the third bench a snowslide had killed thirteen head of stock, several men barely escaping death. Not being provided with block and tackle, we found sledding on the steep ascents to be desperately hard work. The prospectors in this respect had much the advantage over us.

I set out May 3 to put forward the cache as far as possible, and after going 3 miles I found the trail beyond to be impassable. A severe rain-storm prevailed, making the trail very slushy. Fearing another long delay, I dismissed three of my men and sent them back to the beach. The party now remaining, in addition to myself, consisted of Corpl. Robert A. Koehler, Company B, Fourteenth Infantry; Private Henry L. Tolley, Company H, Fourteenth Infantry; special agent of the War Department, A. W. Gumaer, and civilian employee, Harvey A. Robe. My assistants were especially selected for their pluck and endurance. Upon this date a snowslide was reported to have occurred at the base of the summit at 10 p. m. the previous day, two men being killed. The rain-storm cleared away and we put forward 400 pounds more to the advance cache, making 1,600 pounds put forward during the day, of which 1,440 was clear food. By the men whom I sent back I dispatched a request to send forward additional supplies, urging the importance of a large cache beyond the summit. I observed that the glacier is commercially an impracticable route at any season. One thousand people going back and forth in March and April, and possibly late in February, may keep it open for sledding by man power part of the time, by horse power less of the time.

May 3 we moved our camp equipage and 340 pounds additional provisions sent out by Captain Abercrombie as far as Five-Mile camp to Twelve-Mile camp in two trips, and moved our entire cache to the same point by working far into the

night, while the trail was frozen. May 5 Mr. Robe and myself went back to Five-Mile camp and brought up the last remnant of 284 pounds at that point. The terrible heat of the sun made the trail so slushy that we were four hours returning. I call the fourth bench 16 miles from the beach. During the day the party worked raising the cache over the fourth bench, nearly finishing the task. I observed that the trail at this season is always slushy and slumpy after 9 a. m. It stiffens up again at about 9 p. m. enough to bear a man, and enough to bear horses at 1 a. m. The horse and foot people were violently at odds, each interfering with the other, on account of the trail being but 18 inches in width. Horses in use upon the trail quickly learn to hold it, for to step aside means to slump down very deep in snow.

May 6 we raised the cache completely by working after midnight and sleeping late in the day to rest the eyes of the party, which were all badly "touched." Snow-blindness is a sad affliction everywhere on the glacier. Many people are led away totally blind for the time being. This condition is caused by the terrible glare of reflected sunlight upon the snow and by the long hours of daylight at this season and latitude. Most people are affected at a time when they least expect it—namely, when the sun is concealed from view by fleecy clouds which settle down upon the glacier. At these times the refraction and diffusion of light rays is more trying to the eyes than direct reflected sunlight when the sun itself is not obscured. This day the roar of avalanches of snow upon the mountain sides of the glacial gorge was continual. In many places the body of snow upon the bosom of the glacier falls through crevasses before unseen. I now had 1,840 pounds of clear food at the top of bench, and after nightfall brought up my camp to the same point.

May 6 and 7 we worked on through the night, hauling 700 pounds to a point near the foot of the summit ascent, about 20 miles from the beach. We also worked on through the night of May 7 and 8, advancing 900 pounds more to the foot of the summit. May 9 we raised camp and the balance of our provisions to the foot of the summit. At this point I found many people disheartened and turning back. Tons of provisions lying in the cache were buried and lost by the last great fall of snow. All along the trail I was subjected to the miserable humiliation of being passed by civilians with their

outfits, having in use horses, mules, burros, dogs, and even goats. Our Government party was, of all the outfits I saw, the most poorly provided with means and material for progress. I observed that range horses, half-breeds of 800 or 900 pounds in weight, such as are raised in Montana and Wyoming, are the animals of the greatest utility upon the trail, and best retain their flesh. Beyond the glacier they will be equally useful as pack animals under the sawbuck saddle. Mules on the glacier, while useful, are not so desirable on account of their small feet breaking through the crushed trail. On the night of May 9 we raised 329 pounds to the top of the summit by back-packing. The summit ascent straight away along the block-and-tackle trail is 5,100 feet in length and 1,100 feet in height. This length I learned by the amount of rope in the blocks.

May 10 a severe blizzard prevailed, and we remained in our sleeping bags, emerging only long enough to cook when hungry. Everybody suspended work upon the summit, being unable to see more than a few feet. May 11 we resumed back-packing and placed 2,000 pounds halfway up. Five members of the party were strung out and each man packing 60 yards, thus lifting the entire cache 300 yards at once. May 12 wet snow fell, but we worked notwithstanding. Private Tolley succumbed to exhaustion. May 13, the snowstorm still continuing, we hoisted a portion of our cache, but were deterred from working longer by the obliteration of the trail. Private Tolley remained sick in his bag.

May 14 we broke camp and moved to the top of the summit. The lower camps were rapidly moving up to the summit by working night and day, on account of the obliteration of the trail on the lower benches. A similar condition prevailed in the interior, beyond the summit, and the whole procession of gold seekers stopped in timber to essay the building of boats. Whatever the leaders do all behind blindly imitate, whether they know or not that navigable water is ahead. This day Private Tolley's condition became so alarming that I resolved, upon putting the last pound over the summit, to make my way back to the beach and send up the hospital steward with a detachment and bring him back. A civilian physician had already diagnosed his case as typhoid fever. I also wished to see for myself whether or not I could get pack animals over the glacier. I left the summit at 12.30 p. m. and

arrived at the beach at 7.30 p. m. I found it impossible to get pack animals from this point over the glacier to my cache. I left orders with the corporal to move on down the reverse glacier to timber—an easy descent for about 8 miles, and there await my return. Should my proposal meet with the approval of Captain Abercrombie, I would send back the detachment and go myself alone into the country, throwing in my cache as a grub-stake for a year and a half with a party of prospectors representing eastern capital, and provided with proper means for penetrating the country. So far as I can see, this is the only way that a cache can be now used to get maps of the country.

Lieutenant Preston did not return to his party. The following extract from a report made by Guide Gumaer gives a synopsis of this expedition until its return to camp:

"Lieutenant Preston set out at once for headquarters camp for the purpose of sending the hospital steward to the rescue, with instructions to take Tolley to the beach. I was ordered by the lieutenant to remain on the summit until the hospital steward arrived, and, when Tolley had gone, to move our cache down the other side of the glacier to Twelve-Mile camp at the timber, there to await further orders. On the third day the hospital steward arrived, and Tolley, thanks to the kind treatment he had received from Mrs. Dowling, was perfectly able to stand the trip to the beach. The next day the hospital steward and his men placed Tolley on their sled and started for camp. After he was gone the three of us who were left, Corporal Koehler, Harvey Robe, and myself, loaded our sleds and started for Twelve-Mile camp, on the other side of the glacier. The descent on the other side is a gradual slope, ending about 6 miles down at the foot of the glacier with quite a steep descent, the amount of load a man was able to take down hill being only limited by his ability to hold back. At the foot of the glacier we found a few tents, but as this was not down to timber, we continued on over a level valley, with a small stream running from under the glacier. This valley is about 1 mile wide. It is gravelly, with small bowlders worn round by the action of the glacier; high mountains on each side as far as Twelve-Mile camp, where the valley widens out and timber commences, the latter consisting of spruce and cottonwood. We arrived at this point

about 8 p. m. and pitched our tent for the first time on the trip.

"This camp contained about one hundred and twenty-five tents on both sides of the stream, in good timber. A great many parties were whipsawing lumber preparatory to building boats, and a great many boats were in all stages of completion. This was a busy camp. Here we remained until May 28, going back to our cache at the summit until it was all sledded down and safely placed at our tent door. Then we proceeded to look around. We took several long walks down the river to other camps, and climbed the slope of the mountain on the other side of the stream opposite to our camp, where a fine view was had of the large lake which lay down the valley from us about 16 miles. I took the bearings of this lake from where I stood on the slope of the mountains and found it to be nearly due north.

"May 28 we received orders from Lieutenant Preston, commanding in the absence of Captain Abercrombie, to turn our cache over to E. J. Cooper, who would look after it, and return as soon as possible to headquarters. This I proceeded to do, taking Mr. Cooper's receipt for everything, which was turned in to Lieutenant Preston on my arrival. Our return trip was a very hard one. We walked twenty-five hours steadily without any sleep, over a very difficult trail, the snow having melted off the glacier since we went over, opening great crevasses, and making it necessary for us to pick our way to avoid falling in some hole or crevasse of unknown depth. This we ascertained by dropping stones down places where we could not hear them reach bottom.

"On our arrival we found Lieutenant Preston in command, he informing me that Captain Abercrombie had gone after pack ponies. This I considered very necessary, as it is impossible to do anything in this country without pack animals of some description, and I consider the pack pony the best animal for this purpose. In fact ponies were selling on the glacier at that time at from $260 to $500 each, and those having such animals were going more than twice as fast as those without. Dogs do very nicely on the snow, but are of no use at any other time."

REPORT OF HOSPITAL STEWARD JOHN W. CLEAVE.

VALDEZ TOWARD COPPER RIVER.

It appears that no information was obtainable as to the country beyond the canyon from which Lowe River emerges at the head of Valdez Valley. "Squaw men" who had gone thus far questioned the possibility of proceeding farther than the source of that river, yet it had been determined that the end of Corbin Glacier, of the so-called "Summer Trail," is at the head of said canyon. To determine whether or not it were possible to reach the Copper River in that direction, and especially if the route were practicable for a pack train, was the object of this expedition.

On Sunday, June 19, 1898, an expedition consisting of Lieut. P. G. Lowe, Hunter Brown, Corporal Heiden, Private Studt, and myself started from Valdez. An equitable division of the load was made, one carrying a knapsack and three carrying Merriam packs. The pack of each consisted of one blanket and half shelter tent and the salt beef, flour, and coffee portion of the ration for fifteen days. To June 24 the expedition was under command of Lieutenant Lowe and will be covered in his report. On that date Lieutenant Lowe suggested that himself and Brown confine themselves to Valdez Valley, while the others explore toward Copper River. Accordingly we divided the provisions and started to cross the foothills forming the south side of the canyon separating the first, or Valdez Valley, from the valley beyond, now known as the second valley. Heavy rain made us camp early. We cooked and ate a porcupine, of which we saw several.

Next day, June 25, we reached the second valley. By keeping up high we avoided all brush. June 26 and a part of June 27 we spent in bridging the stream issuing from the east end of the Corbin Glacier. We then visited the camp of some prospectors close by. They were three Dutchmen, the only people in the valley, and they were unable to give us any information except the welcome news that they had

bridged, with two logs, the glacier stream issuing from th next canyon. They also replenished our slender stock of pr visions, we giving them written assurance that they woul receive the equivalent at Valdez.

June 28 we marched to the head of the beach, where th drenching rain kept us till June 30, when we made an exa perating march over fallen timber and through brush. Jul 1 rained again, and we spent the day mending our pack having luckily brought along thongs which answered th purpose very well. We had been so greatly annoyed at th loss of time occasioned by the rain that we determined there after to ignore it. This we did, although the discomfort o being wet was of less moment than the task of carrying th additional weight caused by blankets, etc., being soaked.

July 2 we marched over moss and bog, crossing three dee ravines containing swift mountain torrents, to the head o the valley. The valley has about the same dimensions as th Valdez Valley, being really one with it, running northeas and intersected only by foothills. The west end has 5 mile of beach, over which the Lowe River runs, changing it channels as it floods and falls. After the first mile the strean from Hogback Glacier has to be crossed. One and one-hal miles beyond is a canyon running north and a valley running south, from each of which issues glacier water which ca neither be forded nor swum. Beyond these important tribu taries the river shrinks to half its volume, and comes from canyon east about 2½ miles beyond. This canyon, after run ning 7 miles northeast, ends at a glacier at the south side o a valley. Half the water in the canyon comes from thi glacier, or rather system of glaciers; the remainder from snow-laden beach which runs from near the mouth of the canyon to the north side and end of the valley, where is the glacial source of Lowe River. This beach is 1 mile wide and 8 miles from the beach at the west end of the valley. The intervening foothills consist of benches, with alder bushes and grass and moss plats, unfirm from melting snow. Half-way up the valley ends the timber, which is spruce and cottonwood. Before reaching the timber line so great is the number of fallen trees that walking, especially with packs, is very difficult. We now know, however, that by keeping to a bench higher up the mountain we can avoid most of

what hindered us so greatly. We killed duck and ptarmigan in this valley and saw two fine black bear.

At the eastern termination of the bench containing the head waters of Lowe River is the divide. Within a few yards and almost on a level one stream runs east and another west. Following the water running east we, on July 3, entered what may be known as the third valley. Streams from all sides augmenting it, we followed our rivulet about 2 miles to its junction with a glacier stream from a glacier at the south end of the divide. At the junction a narrow canyon commences and we left it to climb the foothills, which are here high and chiefly on the north side of the valley. We went over snow and soggy grass and occasional bogs to the first of a ten-mile series of beaver pools. Here, on killing a beaver and some ptarmigan, we camped. To celebrate the Fourth of July we prepared ourselves a feast of duck, ptarmigan, beaver, and wild celery. While we were yet celebrating the sun came out. Unseen for many days, we welcomed it by immediately packing up and marching till long after midnight. We walked over beaver dams, through marshes infested by mosquitoes and yellow flies, and through interminable brush. The way being unknown to us, we climbed the mountain ledges to get views ahead, but waterfalls and cascades would drive us down again to where the ravines were passable. In this manner we traveled three times the distance required, and through brush and mire, which we avoided on our return journey. July 5 was very similar. On that day we traveled more than twelve hours through brush, unrelieved by any open, breaking our packs and tearing our clothes. We also crossed a glacier stream on a bridge of alder bushes. However, from an eminence we saw our river empty into a much larger river running at right angles, and this greatly encouraged us.

July 6 we went down to the beach, the canyon, perhaps 3 miles long, having terminated about 2 miles above. We had clear walking for some 4 miles, when the course of the river again forced us to the brush. Soon the increasing flooding of the river drove us toward the foothills, where we again encountered the beaver pools with their hosts of mosquitoes. We crossed the second glacier stream on the north side of the valley on a fallen tree. Here is the first timber in the valley, spruce and cottonwood.

July 7 we walked around the beaver pools, closely following the bear trails. Because of the thick brush and high grass it would be difficult to get along without the bear trails, but every beaver pool has its bear trail around it. At last we reached the big river running south by east. A rocky ridge projects there and many islands are in its course. Over the main channel a volume of vapor hung, such as one often sees over large rivers. Both the rivers were followed. The big river has mountains on either side, the beach width being about 2 miles. In each river it was evident there was no constant channel. Manifestly the large river is Copper River and the rocky ridge part of Cottonwood Island. That would make our river the Tasnuna.

Some 4 miles below us we could see the divide of another river running west—that is to say, entering the left bank, or coming from the east—that we determined was the Bremner River. So inspiriting was the scene that we debated whether we would endeavor to go down the river to its mouth at Alaganik. Our provisions were exhausted except for the emergency caches we had left at each camp for our sustenance on our return journey, yet we had ammunition and we expected to find Indians, although we saw no sign of human life, nor had we seen any since leaving the three Dutchmen. At last the uncertainty as to the continuance or recall (because of the war) of the expedition ruled and we decided to return. We first climbed a mountain to 2,500 feet, but fog prevented our seeing what we desired. Like all the mountains we passed, the formation is slate. We saw beds of violets, roses, and other perfumed and gorgeous flowers. Wild currants and other berries, wild celery, and skunk cabbage were plentiful. Alder bushes are everywhere, and dwarf birch is occasionally seen. Devil's clubs are universal and as annoying as the mosquitoes. Good grass is everywhere and grows extremely fast. Timber is scarce, but there are occasional patches of spruce and cottonwood. We saw moose tracks, but saw no moose. We saw one mountain goat. Huge eagles were seen almost hourly, and many hawks and sea-gulls. Jacksnipe and orioles are as plentiful as ptarmigan, and, like them, may almost be caught by the hand. Broods of young ducks we saw on many pools, and we saw also wild geese.

The third valley has a rugged look. The second valley seeming to be hedged in by mountains, one would not suspect a third valley before reaching it. On its south side are four big glaciers, two being much larger than the Valdez, one being about two and a half times as big at its end. Brush covers their terminal moraines. Ice constantly breaks off and falls into the river with deafening noise, making the newly-presented face a deep blue.

The valley runs east for 7 miles, then northeast for another 7, being about the same size as Valdez Valley. Although there is a noticeable foothill summit from the Tasnuna side, there is neither glacier nor mountain pass to divide either from the other. Roughly speaking, each of the three valleys is about the same size, say 14 miles by 4 miles, distance by air line; actual trail distance is much more. In this manner the total actual distance to the Copper River from our base of supplies was probably not more than 40 miles. Except for the necessity of bridging the glacier streams, the trail is easy compared with Sierra trails. For animals, also, the country is at this date self-sustaining. The swiftness of the currents attests the grade of the river beds, yet that grade seems uniform. We saw no rapids in the Tasnuna. There are quicksands, however, as in Lowe River, to which it is very similar, excepting for the rapids of the latter. So low is the divide that in winter when the ground is frozen, or at other times if the water subsides sufficiently to enable animals to go along the bed, the pack train should make with comfort the entire distance between Copper River and Valdez in four days. Quicksands on the beach, as well as bogs on the foothills, can be avoided.

Our return journey was uneventful to the divide, which we reached July 11. We had previously noticed a valley north of that traversed by us, which we thought might be that of the Konsena. We desired to investigate, but desisted for the same reason that we did not descend the Copper River. July 12 we shot with the rifle a big black bear. He was hit once in the abdomen and once in the back. The bullet from a .38 Colt revolver glanced off his skull, and we regretted bringing the revolver. A shotgun on such a trip would be especially valuable.

Because of the great flooding of the river, we hastened to cross the glacier stream coming from the north canyon in the

second valley. To do this we marched from 8 a. m. July 12 to 4 a. m. July 13, only to find that not even the rock on which the former bridge rested was now visible. July 13 we endeavored to bridge it by snaking drift logs to the stream. We failed, and lamented the unwisdom of not taking an ax. July 14 we tore up one blanket and our shelter halves into strips, braiding them into ropes to splice logs, but the raging waters tore away ropes and bridge, and carried with them a revolver, our belts, mess equipment, maps, and all the minute details we had compiled for use on our return. We then tried to climb the mountain and get around the stream; but, unlike the glacier next below, there is here a canyon stretching an unknown distance north. Hence, because two days without food, we returned. Next day we should have endeavored to swim the main river twice, as we had seen a bear do successfully. However, at that stage a party of six civilians arrived. They informed the aforementioned Dutchmen of our condition, and these Dutchmen again gave us food. July 15 and 16 the civilian party endeavored to bridge the stream. Notwithstanding the fact that they had axes and ropes, the fearful swiftness of the current frustrated their efforts, and they would have abandoned their expedition had we not been on the other side. July 17 we built a pier of rocks and placed thereon three logs, which projected over one-third of the stream, and we piled bowlders onto their butts. A similar pier and bridge was erected on the other side. We then put a long, thin, dry spruce tree on the cross pieces of each of the three trees, thus completing a bridge which will suffice should the stream even double its abnormal volume as gauged by its surroundings. July 17 we crossed.

The civilian party was under Dr. Lewis, who informed us that Captain Abercrombie had employed them on a trail mission in the valley parallel to the one we had explored. They would even then have been compelled to return had not the three Dutchmen supplied them with flour and bacon, sugar and coffee.

July 18 and 19 we waited for the fog to clear on the Corbin Glacier. July 20 we crossed it. It took us four hours to get from the beach onto the glacier, and another four hours to reach the Valdez termination of it. July 21, after fording the glacier streams in the Valdez Valley, we arrived in camp.

It may be observed that the Corbin Glacier, the glacier to its north, as well as the tributary to the Valdez Glacier, seen from Valdez, all seemed to us to have the same outlet in the second valley. Furthermore, it appeared that by taking the northern sheet of ice beyond the summit of the Valdez feeder, instead of the eastern one, we should reach the glacial source of the Konsena River.

Our trip was enjoyable, albeit severe. Its success was fostered, if not occasioned largely, by the three Dutchmen. They now wish to return to the United States and are without the financial means to do so. They still have some months' provisions and a tent in the second valley, which they are willing to turn over to the expedition as the nucleus of a cache, should the commanding officer so wish. Feeling a lively sense of gratitude for the spontaneous assistance they rendered us, we would earnestly and respectfully request the commanding officer to assist them in securing passage to the United States.

REPORT OF CORPORAL ROBERT HEIDEN,

Company F, Fourteenth Infantry, U. S. A.

UP LOWE RIVER, ACROSS DIVIDE, TO COPPER RIVER.

The work for my section, Section 4, as laid out by Capt. W. R. Abercrombie, was to find a trail up Lowe River and over the divide, and there connect with the third section for exploring the Copper River Valley.

On September 2 I started from Camp No. 1, Port Valdez, with three enlisted men of the Fourteenth Infantry, namely, Privates Studt, Swager, and Tolley, and ten head of pack animals. The progress made was very slow, owing to the heavy rains, which had caused the glacial streams to swell and flow with a rapidity of 8 or 10 miles an hour. In trying to cross the first day our men and horses were washed off their feet several times, and only after several desperate attempts did we succeed in crossing the stream and establishing a camp at the foot of the glacier, at Corbin Pass.

The next day, September 3, we cut trail. September 4 we moved camp early in the morning, and at about dusk reached Camp No. 2, in the foothills inclosing the valley leading into the Keystone Pass. At this camp we were compelled to remain several days owing to the heavy rainfall. On the afternoon of September 8 the rain ceased and we followed the trail that we had cut during the interval to Camp No. 3, about 6 miles farther up the valley from Camp No. 2, arriving there late at night. Our pack animals were badly done up on account of miring down in soft ground. The rain commenced again the same night, and as we had to cross the valley in order to make the mouth of the first canyon in Keystone Pass, we were forced to wait for the water to fall before we could proceed. Lowe River is fed principally by glacial streams, and when a warm rain sets in, which causes the glacier to melt, it rises to a tremendous size, making it impossible to cross the valley through which it runs. Whenever we had a few hours clear weather while waiting for the river to fall, we

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utilized the time by cutting trail through the dense growth of alders, and graded the hillside, which was extremely hard work.

When the water had fallen sufficiently to allow us to cross the valley, we had the trail all ready, and moved camp to the first canyon in Keystone Pass. This canyon is about 2½ miles long. The walls on both sides are almost perpendicular, rendering it necessary, therefore, to find a route around one of its sides. I divided my party and sent men out both sides of the canyon to find the most practical route for a trail. On this stretch from the mouth to the head of the canyon we made three camps. From the head of this canyon we had about 4 miles of comparatively easy traveling over what is known as the "Inter-canyon Basin."

The second canyon is not quite so long, and is followed by another valley. The weather was very cold, the snow falling constantly on the mountains, reaching a depth of several feet, and coming down almost to sea level. From the head of the second, or Cleaves Canyon, we bore to the north in order to find a low pass through to the Konsena River over which we could cut trail. Before reaching the foot of the mountains, where the ascent commences, we had to cut through about 5 miles of alder brush and windfalls, very slow progress being made. After two days' exploring we succeeded in finding a way around the canyon and went to work cutting trail. From this point on a great deal of grading had to be done, as the steepness of the hills made it impossible for animals to travel on the hillsides. It required about two weeks' continuous hard work to make a trail around this canyon, and at some places we went over an altitude of 2,600 feet. This could all be avoided by blasting a roadway close to the river through the canyon, while of course it would require a great deal of work and could not be accomplished without expense.

I detailed two men of my party to explore the valley of Konsena River. They reported that a pack train could be brought through to the first lake without difficulty. The elevation of the Konsena River is somewhat higher than that of Lowe River. With but few difficulties to overcome, this trail could be prolonged to the mouth of the Archer River and from there to Copper Center.

A courier arrived in camp with the information that the third section of the expedition had been unable to find a practicable route up the Konsena, and had chosen the valley of

the Tasnuna as a route by which to go out to the coast. We therefore came back to the mouth of the second canyon and endeavored to find a trail in an easterly direction so as to meet them. After three days' traveling we found them, without horses and almost without provisions, and learned from them that they had lost their whole outfit and drowned one man in trying to cross the Archer River on a raft. At that time, October 13, the snow commenced to fall on the level, and continued until there was a depth of 2 feet. The object of my section being accomplished, I returned to Camp No. 1, arriving there October 20.

The great advantage of this trail is that it is free from glaciers; consequently, the traveler has not to suffer from want of wood. In the winter and spring, when the canyons are filled with snow, one can sled on the crust down to a point where the Tasnuna empties into the Copper River, a distance of 49 miles; and in the summer time this trail can be used, making this route available all the year round to the Copper River Valley. With but small difficulties to overcome, a railroad could be built to the Copper River country by this route, as the grade from Port Valdez up to the Tasnuna Divide is almost imperceptible, with the exception of the points where the railroad would have to be made through the canyons. The hills on both sides are covered with spruce and hemlock and the valleys with cottonwood. As soon as snow melts off the ground grass sprouts up in abundance, which gives an ample supply of food for pack animals. All kinds of berries can be found on the hillsides—salmon berries, huckleberries, blueberries, and cranberries. As to game, three species of bear exist here, viz, black bear, brown bear, and the silver-tipped, or Alaskan, grizzly bear. Grouse and ptarmigan abound in the mountains. On the far side of the Tasnuna Divide innumerable beaver dams can be seen. Gold can be found in all streams, and I am confident it will be found in paying quantities as soon as a class of prospectors come into the country who will go at prospecting with energy. I have panned out as high as 50 cents to one pan. This was taken from a small crevice at the mouth of the second canyon on Keystone Pass, a sure indication that the gravel in the valley contains gold. So far the country has not been prospected, as it is impossible to reach bed rock during the summer months owing to the water. Gravel banks of washed

gravel can be found to a height of 50 to 500 feet, sure indications that the basin was formed years ago and filled with water to that height. In my opinion it has been a tremendous stream or lake that has washed the gravel into it. To thoroughly prospect this vast territory would require at least two years' work, and I am confident from all indications that pay dirt can be found.

REPORT OF CORPORAL ROBERT A. KOEHLER,

Company B, Fourteenth Infantry, U. S. A.

PORT VALDEZ TO COPPER RIVER, DOWN COPPER RIVER TO PRINCE WILLIAM SOUND, THENCE TO PORT VALDEZ.

The party consisted of Schrader, geologist; Mahlo, surveyor; seven enlisted men, and three packers. The pack train consisted of twenty-three animals. Each animal carried an average of 175 pounds of provisions, including bedding. Each animal was led. We crossed the valley and reached the foot of the glacier after traversing a distance of about 5 miles. During the ascent a heavy fog settled on the glacier, which made it very difficult for the men to pick the way. The yawning abysses surrounded the party, compelling the horses and men to proceed very slowly. In some places the trail was not over 2 feet wide, with crevasses right and left 50 feet wide and hundreds of feet deep. To fall into one of these crevasses meant instant death to men or beasts. The horses with characteristic instinct seemed to realize the perils that surrounded them, and, like the men, measured every step as they proceeded; even the bucky ones were meek as lambs. On account of the difficult ascent the horses had to be repacked very often, as the sling ropes would loosen and this would cause the pack to slip. At times an animal would slide into a crevasse and all hands nearest would immediately proceed to help. In such a case the horse was quickly unpacked, the men would place a rope around its haunches, and then with a strong pull and a pull altogether the animal would finally be liberated. As one man after another reached the top of the bench a shout would be uttered. Finally, after many difficulties, the glacier was passed. On the other side the traveling grew better and the crevasses were not so many. At 9 o'clock in the evening the foot of the fourth bench was reached. Fifteen miles were covered on that day and it was decided to camp at the foot of the fourth bench. The picket line was prepared by using big bowlders as posts,

and the horses were unpacked and fed. In the meantime it was raining continuously and every man was wet to the skin. In order to gain shelter of some kind the little dog tents were put up on the ice. None of the men slept that night. On the morning of August 6 a heavy fog pervaded the atmosphere so that it was impossible to look in any direction but a short distance. The train was put on the move at 7 o'clock a. m., and the most dangerous part of the glacier, the top of the fourth bench, was laboriously approached. The packed snow was used as a bridge, and in this way the train crossed crevasses from 6 to 15 feet wide and thousands of feet deep.

Now and then the horses would plunge and drop through one of these treacherous bridges, but before proceeding far would catch themselves with their fore feet on the ice. Then the pack would be undone, the ropes placed around the animals, and by this means they were saved.

Finally all of these terrible obstacles were overcome, and the top of the fourth bench, where the crevasses began to get narrower and less numerous, was reached. From the point named good time was made. From the fifth bench the course was northeast in order to use the packed snow to proceed on. By this time the rain had turned into snow and it grew colder and colder as we proceeded toward the summit. An ice-cold wind blew down from the summit, cutting the faces of the party very badly. Occasionally the fog would clear away, which would give us a chance to see the top of the summit and travel in the right direction. When the top was finally reached a fierce snowstorm was encountered. A 3-mile drive brought us out of the storm, where the blue sky could be seen and the men could feel the genial rays of the sun once more. Keeping to the right and away from the crevasses, we descended into the Klutena Valley. By 3 p. m. the pack train reached camp, and the trip, which up to this time had been thought an impossibility in summer, was successfully accomplished. Camp was established about 1 mile from the foot of the glacier, where the horses were turned loose after being unpacked, and allowed to graze. This trip was made in twenty-nine hours. This camp was made on the left of the Klutena River, in a valley about 2 miles wide and 4 miles long. In this valley was found some grass, but other vegetation was poor. There is no timber in this valley, and alder brush was utilized for cooking purposes.

August 8 our party, consisting of six men and fourteen pack horses, left in the morning for the Twelve-Mile camp, 4 miles farther down the Klutena River. It is called the first timber, because here is where spruce makes its first appearance. At this point Messrs. Schrader and Mahlo, myself, and four men and nine horses remained. It was the intention of the party to take up work from the summit. On account of the weather Mr. Schrader was compelled to stay overnight on the glacier, in company with Private Hallett. Mr. Mahlo and assistants arrived in camp about 8 p. m. Private Gardner utilized his time in gathering flowers and pressing them. On August 10 the weather was clear and still, and the air was filled with mosquitos. The valley was measured almost to the Twelve-Mile camp, and Mr. Schrader finished his work on the glacier. On August 9 twenty stranded miners passed the camp; most of them were penniless, having lost all they possessed in the rapids of the Klutena River. August 11 camp was broken at 7 a. m., and we proceeded to cross several side channels of the Klutena until they came to the main stream. Here the Klutena takes her course near a steep bluff, and her waters are swift and deep. At this season of the year the river was big enough to carry any kind of boat. In the latter part of May this same stream, when visited, was insignificant in size. By partly swimming and partly wading, the opposite side of the river was safely reached, with the exception of one horse, which got crowded by the others and was carried off by the current. Subsequently this animal was saved.

In due time Twelve-Mile camp was reached. This camp is situated on the left bank of the river. Here the valley spreads out to a considerable distance. There are several lakes west of this point, where beaver can be found. At this point also the first boats were built. The hills, about 2 miles west, are covered with good timber, some of the trees being 2 feet and more in diameter. It having been learned that the commanding officer had just broken camp, and as the provisions were now rapidly diminishing, we decided to follow the main party to the next camp, as it was only 3 or 4 miles farther down. Packer Kahill was left behind on account of a sore foot, which was so swollen that it was impossible for him to move. Keeping near the bluffs on the left of the Klutena, we traveled over several steep ridges until we reached a flat cut by numerous mountain streams. These streams were easily passed,

although one was quite wide and deep. The valley was soon crossed, and in order to avoid the river the party took to the bluffs. As the trail was pretty rough, considerable trouble was experienced with the horses. Forest fires were also encountered, which became very annoying on account of heat and smoke. Camp was finally reached in an open place. August 12 Mr. Schrader, Private Gardner, Private Hallett, Mr. Mahlo, and Private Bench, taking with them two pack horses, started back to Twelve-Mile camp in order to connect with their work, Private Garrett and myself remaining in Camp No. 2 to herd the stock. Near this camp we found a beautiful lake, about 2 miles square, with a little island in the center. Large quantities of fish, apparently of the trout variety, were discovered in this lake. The party dispatched to Twelve-Mile camp returned at 3 p. m. August 13, and on the day following, the trail being found in good order, with the exception of fire and smoke, we broke camp about 11 a. m. Owing to the moss being afire, the feet of the animals were badly burned, and great difficulty was experienced in keeping them from being stampeded. Some beautiful valleys, covered with an abundance of grass and shrubs, were crossed during the day. Flowers and berries, especially wild currants, were found to be growing in every direction for several miles. Occasionally different kinds of butterflies could be seen playing in the morning sun and trying to catch each other. The bumblebees were busily engaged in gathering up their food, and mingled with the monotonous hum of the bumblebees were the sweet notes of numerous birds. In fact, everything was alive and seemed to be doing business.

The transition from this little paradise into a mass of burning timber was not a pleasant experience. A barren ridge was passed over, on which it was difficult to find the trail, as the marks and blazes had entirely disappeared. After having covered a distance of about 5 miles, camp was established at about 5 o'clock in the afternoon. August 15 Mr. Schrader and myself went up the mountain to take a picture of the lake and its surroundings. Reaching a height of about 600 feet, we saw spread before us an impressive panorama of the whole valley and Lake Abercrombie. Camp was again broken at 2 p. m., and after crossing a very swampy piece of land the timber was reached. Here the progress of the party was suddenly stopped by a large-sized glacier stream, a tributary of

the Klutena. This obstacle successfully crossed and a trail hit on the other side, trouble was experienced on account of the timber, which was burning, falling, and blocking the trail. Notwithstanding these obstacles, the head of Lake Abercrombie was soon reached, and camp was made in the immediate vicinity. At this point provisions were sent down the lake by scow to Klutena City, a camp at the foot of the lake, in order to give us a chance to travel light and make good time. Camp No. 5 was broken at 2 p. m. August 17, and we reached Cranberry Marsh, 10 miles farther down, at 10 p. m. This camp is situated near Salmon Creek, and has about 50 tents. A good deal of hay is put up here by prospectors, as it is a fertile spot and adapted to cattle raising. Lake Abercrombie is about 23 miles long and from 5 to 10 miles wide. Fish, ducks, and geese are to be found in abundance in and about this lake, into which the Klutena River empties. The entire valley is fertile; vegetables can be raised, and cattle raising, if properly managed, could be made successful. The river leaves the lake at its foot, and after a run of 37 miles joins the Etna, or Copper, River. The next camp reached by the party was Klutena City, situated at the foot of the lake, 15 miles distant. This is a big camp, with about 100 tents. It is about 200 yards below the town and on the left bank of the Klutena River. Here we were provided with provisions, which had been previously sent to this point by scow. Considerable difficulty was experienced at this point by our party on account of the horses straying away. I met here several old acquaintances from over the glacier, who informed me that a great many miners would winter over, as some of them had provisions enough to last them for the next three years. Other alleged prospectors were dissatisfied, as they had not discovered gold by the bushel. A good many I think never saw a mine and would not know gold if they found it. We heard nothing of strikes being made on the head of the Tonsena River, although "colors" can be found in any stream. August 24 Messrs. Schrader, Mahlo, Garrett, Gardner, and Packer Kahill reached camp.

West of this camp is a high mountain, from the summit of which the Klutena Valley, Mount Drum, and Mount Wrangell can be seen. August 28 camp was broken about 9 o'clock in the morning, and by 2.30 p. m. the head of the rapids of the Klutena River was reached. At this point the river forces

its way through narrow canyons. The volume and speed of the water is tremendous, the velocity of the stream being about 10 miles an hour. A number of people have lost all in this river. At this point is a camp of about 60 tents. Cox Landing was reached about 5 p. m., and here camp was made. Near this point is a spring of excellent water, called Beaver Spring. At 7 a. m. August 30 camp was again broken, and an attempt was made to reach Copper Center, 12 miles distant. This is the main camp on the Klutena River. The trail is very deep and runs up the bluffs at the height of about 600 feet; on reaching the top of the bluff the trail runs on the left side, and parallel with the river, from which an excellent view can be had of the surrounding country. One can see the basin of the Copper River, and still farther can be discerned Mounts Drum, Sanford, and other important points. Camp was reached about 5 p. m. About 2 p m. on August 31 we again started on our way to make connection with Corporal Heiden and party from Valdez. One horse accompanied the party. This animal was tied to a long rope and held by one man while three men handled the boat.

At a given signal the boat was started and the animal driven in. As the current would carry the horse down pretty fast the man with the rope would slack up accordingly, and the animal would land about 200 yards below the landing place. Camp was again broken at 8 a. m. September 1. We followed the bluff of the Copper, cutting our way through heavy underbrush, but were finally blocked by deep ravines. It was therefore decided to descend the hill and follow the river bed as much as possible. Camp was established at 7 o'clock in the evening. September 2 camp was again broken, and by night an Indian camp was reached. These Indians live in well-constructed huts about 20 feet long and 16 feet wide. They are built out of poles about 6 inches thick, which are tightly lashed together with willows. This frame is then covered with spruce bark and moss. The door, which looks like a box, is about 3 feet high and 2 feet wide, and therefore causes a grown person to enter the cabin in a stooping position. The interior of this structure is roomy and light, which latter is caused by an opening in the roof. This is also used for the smoke to escape, as the fireplace is exactly under this opening. On two sides of the room are benches put up, which are about 3 feet wide and 3 feet in

height. These are used for sleeping purposes. Little partitions are put up for their dogs. A little round opening, and right opposite the door, indicates the entrance of the bath house. Asked about the rivers ahead of the party, it was found that the first one was called by them Konsena, and not Tonsena. They knew nothing about Teikhell River. For every little stream they have a name, but, strange to say, none for the mountains. Mount Wrangell is imitated by puffs of smoke.

September 3 several channels of the Copper River were crossed until the expedition came to the foot of a steep bluff. As at this point the river shoots against the bank we were compelled either to build a trail up the hills or to try and get around the foot of the bluff. After numerous difficulties met with during the day we went into camp. On the following day our party worked its way over two high bluffs, which, after following them for several miles, we descended into a flat about 5 miles long and several miles wide. On September 5, 6, and 7 considerable progress was made without many serious misadventures. Camp was again made on the evening of September 7. September 10 the Tonsena River was reached at a point several miles above its mouth and camp was made. On the following day an attempt was made to cross the river by boat, but it failed. At this point I washed out eight to ten colors of gold to a pan.

September 12 and 13 were utilized in building a raft with which to cross the river. It being completed, the pack animals were brought to the river side at the point of embarkation and unpacked. The animals were driven into the river, and after battling with the rapid stream were safely got across. The members of the expedition then embarked on the raft. No sooner, however, had we gotten fairly started before the raft drifted onto a bar. The raft was soon got afloat again, but the current was so strong that it drifted quite a way down the river before it got into the main current. Notwithstanding all the efforts of those on the raft, it was propelled by the strong current against the bank the men had just left and was carried with incredible swiftness past islands, bars, and bowlders. Propelled in this way, a steep bluff was approached, with some timber near the banks. At this point I, holding a rope, tried to make a landing. No sooner, however, had I touched the water than I was hurled around and

over like a cork. I had to let go of the rope, and swimmin now on back and now on belly, succeeded in pulling myse up by getting hold of a root. Private Garrett, who h jumped in to help me get the rope fast, was lucky enough get out. The raft finally stranded farther down against son driftwood. By this time Private Garrett, who had got off t raft farther up by catching hold of an overhanging tree, can in, he having crossed the river on a mule. At this junctu intelligence reached me that Private Archer had been drowne After many desperate struggles, the cook of the expeditio succeeded in throwing a rope to the parties on the raft, whic he had fastened to a big spruce tree. Now, as everything w wet on the raft, it became top-heavy, and it had to be lightere in order to float again. By the use of poles the raft w brought into deeper water and reloaded, it taking an hour t do this. The idea was to let the current drift the raft towar the shore by the help of the rope fastened to the tree. At th critical moment, just when the raft was swinging around, th rope slipped. An attempt was made to catch the rope, but i did not succeed. To our despair the raft floated down th river and disappeared in the darkness, carrying a number o men with it. Suddenly a voice was heard, which proved t emanate from Private Bench, who had jumped off to sav himself. He was pulled ashore, and the opinion was expresse that most of the men on the raft were lost, on account of th darkness and because some of them could not swim. Thu a terrible night was passed. As soon as day dawned the me on the raft were searched for. Following the river, a blanke was observed and several other things on some drift. Afte some loud shouting the cries were answered and the peopl who were on the raft were located. They had all reached th shore safely.

As the provisions had all been lost, the situation of ou party was now critical. As good luck would have it, how ever, Colonel Fritz, a prospector from Copper Center, wa camped near by on the other side of the river. The situatio of the party was made known to him, and he helped us ou with flour, bacon, and potatoes. Search was made for Privat Archer's body, but it could not be found. The 15th of Sep tember was spent by the men in drying their clothes, blankets etc., and pulling such stuff out of the driftwood as was dis cernible. To add to the distress of our party, intelligenc

reached them that Private Hallett had lost the provisions which he had taken with the pack animals, about 40 pounds in all, in crossing the river, and had had a hard time to save himself.

September 17 was spent in cutting a trail a distance of about 7 miles. The following day it was decided that it would be necessary to get to the cache of the expedition located at Taral as fast as possible, a distance of about 37 miles through an unknown country. By climbing some trees a ridge running parallel with the Copper River was discovered. This ridge was followed for 2 miles. Here a steep canyon, through which a swift mountain stream was making its way, blocked our progress, but finally a place suitable for crossing was discovered. The distance made this day was about 8 miles. The Copper River is about 2 miles to the left at this point, and its banks are very rough on account of the many canyons. On the following day an Indian trail was struck running south 80 degrees east, and in the same direction in which we were traveling. Following the trail, a place was finally reached which allowed us to get a good view of the Copper River. In the distance could be seen some Indian houses down in the valley. They were made to understand that we were hungry, and the chief furnished some salmon freshly caught and some dried fish. We returned the hospitality by giving the Indians all the tobacco I possessed. About 7 miles was made this day.

Camp was again broken on September 20, and as we were traveling through a low country the party had to contend with many swamps. We passed about ten lakes of different sizes, crowded with ducks. Camp was made about 4 miles distant from Taral, after covering a distance of about 9 miles. On the following day, after traveling a few miles, our party, by keeping itself on the edge of the bluff, could see Taral clearly. Finally we arrived at the river, where we found an Indian house, and in which we were able to obtain some hot tea, which was served in nice, clean cups. The cache of the expedition was found to be about 1 mile farther down the river. It consisted of 100 pounds of flour, 50 pounds of beans, 50 pounds of bacon, some fruit, and some onions.

September 22 was utilized in prospecting for a trail. The following day a trail was cut up the bluff, near the right of the camp, about 1,200 feet. About night the top of the trail

was reached. On returning to camp several prospectors were met who had come over from Taral, and who informed me that it would be simply impossible to get my stock through on account of the high mountains and numerous canyons. Wishing to convince myself, accompanied by Private Gardiner and an Indian, I traversed several miles until I arrived at a deep canyon, the sides of which were very steep and at an angle of about 45 degrees. After prospecting thoroughly the country, I decided that it would be impossible to get the horses through. It was now decided to abandon the stock and reach the Konsena by boat. The horses were left in charge of the Indians at Taral.

Considerable time was now spent in placing the stock and in arranging other necessary details before proceeding down the river. One of the incidents worthy of mention in this part of the itinerary was my encounter with a squaw with a babe in arms, the latter being named "William McKinley," in honor of the President, and wearing an image of the chief executive of the nation about its neck. A boat having been secured September 27, camp was finally broken and our party embarked. Konsena was reached by 5.30 p. m., a distance of about 30 miles. Here was found a camp with about sixty prospectors, and the provisions which had come down by boat from Copper Center. At this point Mr. Schrader became convinced that this was not the Konsena, therefore the camp was moved 6 or 8 miles farther down to another river. The night was beautiful and the aurora borealis illumined the sky.

About 4 p. m. of September 29 the expedition got into the next river and went into camp. September 30 I went up the river with Mr. Schrader to investigate the country. Following the stream for several miles, we arrived at another body of water coming south and joining the first one. Mr. Schrader followed the first and larger one, while I investigated the latter and smaller one. For several miles I advanced and followed the stream, which was making its way through a narrow and steep canyon. Seeing that there was no connection with the divide, I returned. Mr. Schrader had no better luck, as the stream he had followed took its source from a large glacier. This valley, it appears, is not connected with the Lowe River Divide, and Mr. Schrader decided to proceed up the Tasnuna.

October 1 the boat was reloaded and the expedition left for the Tasnuna, which we reached about 1 p. m. This valley

is about 10 miles wide, and can be seen about 15 miles up the river. October 2 was spent in finding a possible route for the progress of our party. It was decided to take the right bluff, as the glaciers would place insurmountable obstacles in the way. At this point Mr. Mahlo was taken down the river, by the order of Mr. Schrader, on account of his physical condition. Shouldering our sleeping bags and provisions, such as we had, with my men I made for the trail. After traveling about 1 mile I was seized with pains in my back, which increasing, I decided to return. Permission was received by me to proceed by boat, as it was decided that I was not able to go over the trail. Camp was broken at 8 a. m. October 5. The Bremner River was passed, coming in from the left, and at 1 p. m. the Bearst Canyon was passed. Following the main channel of the Copper, the head of the rapids was reached about 5 p. m. Here several prospectors were found. This is a poor camp, on account of the scarcity of wood, which is growing in small quantities on the Miles Glacier. The latter is at this point throwing some large granite blocks into the passage of the Copper, therefore the rapids. There is no boat, it is thought, that can live in these awful swells unless carefully handled. Even then it is dangerous. Nevertheless, Captain Abercrombie shot three of these unmerciful rapids. Most of the people line their boats down, but only about two out of five meet with success.

I succeeded in getting my boat down in one hour and forty minutes, and was ready to pass the Miles Glacier. During October 7 tons and tons of ice broke off Miles Glacier, which caused a noise like thunder and made the swells of the river almost reach the camp. In the morning the bay was found to be blocked by ice. Only to the extreme right was there an opening sufficient through which to navigate the boat. By carefully navigating the boat and running occasionally against some ice blocks, the glacier was successfully passed and Childs Glacier approached. This glacier is dry, because it does not throw any ice. There are some pretty high swells along this glacier, and as the current ran about 8 miles an hour, the boat was sucked with the speed of an arrow. The next day Alaganik was reached. October 9 the party left Alaganik, and reached Orka about 10 a. m. October 10.

In concluding my report, I recommend that provisions should be put up in 50-pound double sacks, the outer one

strong enough to stand some wear and tear. The reason is because, on account of the irregularity and sizes of the packs, a good deal of time was lost on the trail in repacking the animals very often, which could have been avoided had the packs been more regular in size. Not alone this, but the horses got lame and sore for this reason.

Fruit is an important article of food for a person in Alaska. As this article will keep a person in health, a good deal of hardship and work can be overcome by the traveler thus supplied.

REPORT OF GUIDE J. J. RAFFERTY.

PORT VALDEZ TO COPPER RIVER, DOWN RIVER TO MOUTH, THENCE TO PRINCE WILLIAM SOUND AND PORT VALDEZ.

My instructions were to explore practicable routes or trails to the interior. My starting point was Port Valdez, which I left May 3, 1898, at 2 p. m. Including myself, five men comprised my party, namely, W. E. Goodman, jr., Peter Harrington, John Curran, and C. H. Kuhlman. The expedition carried with it three Yukon sleds loaded with thirty days' rations and sufficient bedding, clothing, and foot-wear to last until in the fall. It was the intention of our party to remain in the interior until the expedition had completed its work. We were to join the main party at some point on the Copper, on the arrival of the Government pack train, which was at that time daily expected from Seattle. My instructions were to press on with all haste to the Copper River by the Bates Glacier, thence down the Tasnuna, crossing the Copper on the ice, then up the Bremner or Tetehana to its source, and thence overland to the head waters of the Chettyna. Here I was to send back two of the party, or more, if I thought necessary, for supplies, which were to be cached at the mouth of the Tasnuna.

For five days previous to starting our expedition experienced a continuous snowstorm mixed with rain, making the sledding the hardest kind of work. Each sled carried 300 pounds, drawn by two men, thus making 150 pounds to the single man. This proved to be about all that each man could manage. On reaching the lower limits, or foot, of the glacier, the route was found to be blocked and further progress seemed impossible, owing to the fact that a small lake had formed from the backwater of Glacier Creek, which deeply covered the trail for a radius of 200 yards. To leave the old trail and travel in the soft snow, even without a load, was impossible. The water reached above the hip boots of the men, making it unsafe to wade with a load. Rather than

return to camp we joined with some prospectors, who were going on, in cutting a channel through the snow. By this means the water was allowed to escape sufficiently to permit the men to pack their loads to the glacier. Here the loads were reloaded on the sleds, which were hauled up to the first bench by means of a block and tackle. The second and third benches were passed over in the same manner. The top of the third bench was reached at 10 p. m. As the men had no means to cook a meal, a lunch was made of corned beef and crackers, while we slept in the snow in our bags without tent or fire to warm us. At 4 a. m. we were again en route, passing many tents and caches along the trail and quite a number of prospectors who were moving goods toward the summit.

At 4 p. m. Lieutenant Preston's camp was reached, at the foot of the fourth bench. Here was found an oil stove, on which was made some coffee and bacon fried. The next morning at 1 a. m. we started for the summit over the crust with half a load each. Landing the loads on the summit, we returned to camp, reaching there at 4 p. m. The summit was lined with prospectors hauling their goods forward. Caches were made everywhere along the route; goods were piled up with nobody to guard them, and yet nothing was found missing and the best of order prevailed.

On May 6 at 3 a. m. we were again under way, but I soon became convinced that it was impossible for me to reach the Copper on sleds, as the snow was fast disappearing on the north side of the glacier. On arriving at this conclusion I sent Goodman back to Valdez with a request for 300 pounds more of provisions, while I continued on with the loads. The stretch across the fourth bench is a gradual ascent of 8 miles to the foot of the summit. A cold wind was blowing at the rate of 45 miles an hour, making it necessary to keep closely bundled up. The wind blistered the faces of my men and made progress very difficult. The trail was filled with snow as fine as flour, forcing us to leave it in many places and take to the crust, which, while it carried our weight, was very rough and uneven, as it had been whipped into wave-like drifts that caused a jerking motion which severely galled our shoulders. As all the canteens on this trip had been emptied, ineffectual attempts to secure water from the several camps were made. Water was subsequently procured by melting snow over an oil stove or over a wood fire.

Wood is not plentiful on the glacier, and on this particular trip a famine prevailed on account of the big storm, which lasted on the summit for eight days previous to starting, and no opportunity was had to make a trip to the timber, 20 miles distant. Wood was quoted at 15 to 20 cents a pound, and little offered at that. On the night of May 6 our party camped on the summit, and, having neither oil nor wood nor stove, I made an arrangement with a man to feed his party of six for the privilege of cooking for my own party of four. I did not take a wood-burning stove because I was already loaded to the limit when I left, and no oil stoves were to be had. I knew that once in the timber, or across the glacier, all our cooking could be done at camp fires.

It is my judgment that if one goes properly prepared for the trip, many of the disagreeable features of that particular part of the journey can be easily eliminated. Our greatest discomfort, it appears, was caused by a lack of knowledge as to what was required for the trip. The difficulty of getting fuel, I think, can easily be overcome by the use of the oil stove. As few people knew this before reaching Valdez, the stoves at this particular point were sold at such an exorbitant price as to prevent many from buying them, especially so since they would be of no value after the glacier was crossed. Then the stoves would have to be abandoned. Again, most people passed over with from 1,500 to 2,000 pounds of an outfit, with no power but human muscles to move it up the steep incline. A load weighing 150 to 200 pounds was as heavy as most men could haul up grade. Many were not equal to more than 100 pounds. This involved going over the same road fifteen to twenty trips to move a cache 5 miles forward. This is considered a fair average trip. On the other hand, a horse would only cost $20 at Seattle, or, freight added, $60 at Valdez, and could haul 1,200 to 1,500 pounds, besides making twice the distance. Again, the trails were badly laid out. The inclines up the benches were from 15 to 20 degrees from the horizontal. So steep were they as to make it necessary to use a block and tackel. If switchbacks were put in, or the least attention paid to grade, twice the weight of the ordinary load could have been drawn up by man or beast. This was especially true of the last pitch, where it was all but impossible to get enough men on a sled to haul up 300 pounds. It took four men two hours of hard work to get 250 pounds up the last pitch. The price of horses on the trail ranged about $400 for an 800-pound

pony, and this, too, when the time during which they could be used was drawing to an end. Another point that may be of interest to people contemplating this trip is the matter of clothing and foot-wear. The ordinary clothing of civilization is all that is required. Sheepskins and fur clothing sold at a heavy discount on eastern prices along the trail, and prospectors who had had great experience in the work claimed that there was no necessity for furs. Foot-wear, it seems, was the most troublesome problem. All so-called water-proof leather, without exception, lets in the snow water after being used a short time. Rubber boots are too heavy to travel in, while light lumbermen's rubber shoes with leather upper gives the best satisfaction.

It is necessary to take these to bed to keep them from freezing, as they easily break when frozen. German socks, lumbermen's rubber hip boots, snowshoes, and ice-creepers are an indispensable part of an outfit. The creepers are constantly worn when pulling on a hard trail. The constant strain of hard work, loss of sleep owing to the necessity of working nights on the crust, combined with half-cooked or cold victuals, proved to be a severe trial for the temper of the most of the men who cross this trail. Bitter quarrels arising between partners, or "outfits," as they are termed, proved to be a feature of the trip. The most trifling causes precipitated quarrels, serious and troublesome to those engaged, and amusing and trifling to spectators. When conditions of partnership became unbearable an arbitrator was usually called in and the effects of the disputants were divided as nearly equally as possible. Sometimes an exact division was demanded. This sometimes called for the sawing of a boat in two or cutting a tent through the middle. In one instance during one of these quarrels a member of my party was called upon to act as arbitrator. On his refusal to serve, the litigants went at it themselves and ended by dividing a small grindstone into three pieces. In another case four oars remained. Each man took one and the fourth was broken so that none of them should get any the best of it.

May 7 found the party in Camp "Twelve-Mile"—12 miles from the summit—where timber and water were found to be plentiful. On the following day the expedition started on a soft crust, but only proceeded 1½ miles from camp, finding it impossible to go farther. The snow was now going fast, the creek was rising, and everything indicated a final break-up. Another

start was made at midnight, on a poor crust for travel, and the men were again compelled to return and await Goodman's arrival. The latter reached camp on May 9, having been forced to abandon his sled 2 miles from camp. He brought with him a letter from Captain Abercrombie ordering the expedition to push on toward the Copper and abandon sleds as soon as water was reached of sufficient size to float a raft. There were 12 inches of water on the stream on which we were camped, but the creek was bridged in many places by snow, rendering navigation impossible.

The bare ground cropped out in many places, showing the surface to be a glacial deposit. The base of the mountains was covered with a light growth of timber; the summits were bare of any vegetation. By working at night on the crust we managed to get the outfit 7 miles farther on, each man hauling 75 pounds. The next two days we only advanced 1 mile, each man only hauling half a load. By this time the snow was extremely rotten and was underlaid with water. When one of the men broke through, something which happened every few yards, it was like being in quicksand. Then it required great exertion for him to get out again. It took ten hours to make 1 mile.

An attempt was made by the men to make a trail of their own. Four of them would start out in single file on web snowshoes, each taking his turn at the front. The snow contained so much water and loaded the shoes so heavily that a man needed to be relieved every twenty minutes. Then he was allowed to drop to the rear of the line, where the walking was much easier. To go and come on this trail 3 miles required six hours, and even when the trail was opened it would not hold up a man without snowshoes, nor his loaded sled. If it froze through the night the trail remained; if the snow melted then all labor was lost. The sun at this period of the year began to melt the snow very early in the morning, so that if a man was caught on the trail after 7 a. m. he was likely to have a serious time in getting back to camp. In fact, travel up and down the trail was entirely suspended between May 10 and 15, and preparations were made to build boats. Most of the prospectors along the trail had tools, nails, and calking. Our party, however, had no tools but an ax, which made its members anxious to reach the lakes, 7 miles below, where sledding was still good and the ice about 3 feet thick.

At last all hope was given up of reaching the lake on sleds. The valley was covered with water and the snow, even on high ground, too far gone to allow hope for any benefits from frost. The days were now getting hot. On May 16 arrangements were made with two California prospectors by which members of the expedition were to trade their labor for the use of the tools of the former, with sufficient calking and nails added to build a boat. Timber was very scarce. Some timber was found that would square 7 inches, and sawed out 350 feet, sufficient to build a scow that would carry both outfits. When at last the men of our party were ready to begin building the scow the prospectors, it was discovered, had neither pitch, plane, square, nor ripsaw. The ripsaw and plane were indispensable if the boat was to have joints that would keep out the water. All the camps within a radius of 2 miles were visited for the purpose of trying to buy or borrow the tools needed. But every one was building boats or going to build boats in a day or so and would not part with their tools. At last a man was found who desired to sell his outfit at auction. He wanted an auctioneer, and agreed to build the boat if I would serve in the capacity of vendor. Notices were sent out to the surrounding camps and the sale took place the following day. It took me four hours of pleading to dispose of the lot. About twenty-five men were present and bidding was brisk. Flour brought $20 per hundredweight; sugar, $30; rolled oats, 76 cents per pound; salt, 35 cents a pound; condensed milk, 75 cents per can. Heavy clothing sold at a sacrifice. Woolen socks, German socks, rubber foot-wear slightly worn, brought three times their cost.

It took two days to build the boat, and on May 27 we started for the lake. The boat was named the *Oscar*, and as it was found on starting that it would not hold the outfits of both parties, it was arranged to carry part of the load in another boat going down with me, working my passage at the helm. The trip down was not without incident. An occasional sand bar would be encountered, and when these were met with the men relieved the boat of its weight by pushing her over. At one point a snag was encountered, breaking a hole in the side of the boat above water line. This was repaired At another point the boat was swept into some overhanging trees. By this means Peter Harrington was once knocked into the stream. The lake was reached at a distance

of about 12 miles; it was found to be full of ice, which had just commenced to break away from the shore. The ice was 18 inches thick, and when struck with an oar near the edge would separate into long pieces like icicles.

Under the warm rays of the sun and the wind the ice melted rapidly, and after a sojourn of two days the expedition started to break its way through. This was accomplished by dragging the scow, with twenty men on the line and three men in the bow with pike poles, who broke or shoved off the floating cakes. Tied behind the scow were ten boats belonging to the men working on the line. In this way the foot of the lake was reached on the third day out. This lake is from 1 to 4 miles wide and about 30 miles long, and was named Lake Abercrombie by the men who first went through on sleds. The discovery was now made that instead of the lake being drained by the Tasnuna River it was drained by the Klutena, which enters into the Copper 193 miles above Alaganik and 81 miles north of the Chettyna. The outlet of the lake has always been a favorite camping ground for the natives. Quite a clearing had been made by them in cutting wood. Several summer shelters of spruce bows and poles had been built so long ago as to have fallen into decay. Two caches built of 6-inch poles were also discovered. One contained a lot of furs and a gun. The other cache was empty and showed better workmanship. It is possible that this cache may have been built by a white man, who perhaps spent some time here years ago. A clinker-built bateau was also found tied to the trees with willow withes. The boards were ¾-inch stuff, the ribs 2 inches square. The length of the boat was 20 feet, and it carried a 30-inch beam. The depth of the boat was 2 feet. She had evidently been built many years previous and was badly sprung and weather-beaten. The nails were square cut and of steel. On investigating further a cache of clothing was found tied to the end of a long pole which was shoved up under the overhanging branches of a spruce tree. The clothing was wrapped in a black slicker coat and had not been untied for many years. The covering had rotted away and the contents parted at the touch of the hand. I concluded that some venturesome white man had come up the Klutena many years before and, having spent some time hunting, cached the clothing; then having gone out on the ice, for some unknown reason he had failed to return.

On the afternoon of June 1 the expedition started down the Klutena. The river at this point was close to 100 feet in width, 5 feet deep, and ran as smooth as a mill pond for 5 miles, at which point it divides into several channels. Here were encountered rapids, and boats had to be lined for a short distance. This could have been avoided had the expedition known that the right-hand channel was the proper one for them to take. Camp was made that night at the beginning of the big rapids, which practically extend to the Copper, 20 miles below. Many prospectors were found camped in this vicinity, hesitating to go on for fear of being swamped or their outfits lost or ruined by the water, which was a common occurrence. Rafts that had been used above were wrecked and abandoned to the number of thirty-six in the first few miles.

At this point the river descends in leaps and bounds over bars and bowlders, with a deafening roar that has anything but a pleasant sound for a man who must risk his life and his precious outfit on its treacherous waters. Men who had faced the storms of the glacier for weeks, living on cold victuals, overcoming obstacles that would discourage any but the most determined, with never a thought of turning back, weakened at the rapids. All sorts of plausible excuses were given for going back. The number of men with sick wives at home or urgent business to attend to suddenly became very numerous. All were loath to acknowledge that they had decided to return home for the reason that they met with little sympathy along the trail. To go back meant a lack of courage to go forward, or, in the parlance of the trail, a man who went back lacked "sand" or "got cold feet." Many cached their goods rather than risk the whole of them on the river, taking a few months' provisions with them for a prospecting trip, and then lined their boats down. Others took the safer method of packing on their backs, by which a man could advance with an outfit of 500 pounds just 1 mile a day. Two outfits had horses, and they were exceedingly fortunate, for the traveling on the bench above the river was good. It was scarcely necessary to cut a tree the whole distance to the Copper, and the men who had horses got far in advance of those who depended on boats as a means of transportation.

The boat was here abandoned as being too clumsy to make the trip safely, and the expedition joined forces with the men

who had carried a portion of its outfit from the place where the boat was built. The goods were to be transported to the Copper in their boat, for which assistance the members of the expedition were to join in helping line the boat down the rapids. In the thirty days since leaving Valdez the weight of the goods had been much reduced, and with that belonging to the other party gave the boat a load of some 3,500 pounds, most of which belonged to the other party. The boat was well made and well shaped, broad of beam and deep. I thought that with seven men to handle her good time could be made without endangering the cargo. Six men held the rope fastened to the bow and walked along the bank or, as was often necessary, waded in the stream. The boat was allowed to drift sternforemost to offer the least possible resistance. One man remained in the boat, and by means of a long pole kept her out from the shore and off the rocks. In this way the expedition had proceeded about a mile when, in spite of their efforts, the current swept the boat onto a wrecked raft, knocking a hole in her bottom, partly upsetting her crosswise of the current, so that it swept over the goods with such force as to cause me to hesitate about unlashing them for fear they would be swept into the river. Even with the aid of ten other men who had gathered on the bank they were utterly unable to right the boat, so strong was the current. After spending an hour in the ice-cold water, a bridge was built from the raft to the shore and the goods rescued.

The next two days were spent in drying out. Excepting flour, beans, rice, and bacon, everything in the line of provisions was spoiled. This disheartening experience decided the man who owned the boat to dry out his stuff, sell it and the boat, and return to Nebraska. The crowd at the rapids was invited to the auction sale, for crying which I received the boat. It was decided that it would be safer to attempt to shoot the rapids, and a man was secured as pilot who claimed to have made the trip three times successfully. Nevertheless, the party came to grief on a rock in midstream. For a time, the space of a minute perhaps, they were hung on the rock, and would have been glad to escape with their lives, but were swept off by the current and hurled downstream, striking a dozen rocks before control of the boat could be regained. Finally they succeeded in landing it upon a bar, completely filled with water and 100 yards above the "bad rapids," as they

were called, 8 miles from the Copper. The pilot went off downstream, while the members of the expedition packed the goods ashore and opened them out to dry.

Here I was tempted to give up the notion of reaching the Copper River by boat, but concluded, after discussing the matter with my companions, to give it one more trial. Another patch was placed on the bottom of the boat, the seams pitched and calked, and then it was successfully lined down the river, reaching the Copper without further trouble on June 9. About fifty men were camped here, preparing to go upstream. The expedition remained at Copper Center three days, taking observations of the country. Three of the party went north to Taxlena, by the trail along the river, to ascertain what the chances were of getting pack animals over that stream. There had been one bunch of horses taken up along the second bend, and these all swam the river when it was at its highest. From the bluffs back of Copper Center, at the mouth of the Klutena, the general aspect of the country as far as the eye could reach was that of a rolling plain covered with a growth of small spruce and cottonwood. On the upper benches the ground was covered with moss almost dry enough to burn and so dense that no glimpse of the formation could be had. Both the Klutena and the Copper cut their way through beds of gravel several hundred feet in depth. These banks, when tested for gold by an experienced placer miner, who was one of the party, invariably yielded a few colors to the pan.

It is my judgment that if it be the object of the Government to find a practicable route to the interior from the coast, it is hardly possible that a better one will be found than that starting from Port Valdez. The greatest obstacle along this route is the Bates Glacier; but, in my opinion, if taken in the proper manner and at the right time, the heaviest mining machinery could be transported over it, and after the summit, 4,860 feet above sea level, is reached there is found a grade to the Copper over which a man can haul 500 pounds to the sled during the winter months. In the summer there is a water route over which an experienced boatman, accustomed to rapid water, can take a year's provisions in one trip. Of the distance from the glacier to the Copper, estimated as 75 miles, more than 50 miles of the route is safe boating. Of the Klutena 25 miles is a series of rapids which are by no means

an insurmountable obstacle. The fact that this part of the route was strewn with wrecks and that many men lost their entire outfits I ascribe as chiefly due to the lack of knowledge on their part of how to construct or handle a boat. Of the hundreds of men along the river at that time there was but one who could start from the rapids and take a boat to the Copper with any assurance of escaping safely. Some men made one or two trips in safety, only to be wrecked the next trip. There was no lack of men to make the attempt, but 95 per cent came to grief at some place, there being a marked improvement as the men became accustomed to the dangers to be faced.

Owing to the melting snow making it impossible to get about, there were parts of the route likely to be followed by a pack train en route from the Bates Glacier to the Copper which I had no opportunity of examining. There had been horses taken over on the snow ahead of the expedition, and farther on I considered the route an easy one with sufficient grass growing to furnish ample feed for stock. In the swamps hay can be cut for winter feed. Prospectors starting from the mouth of the Klutena for the head waters of the Copper or its tributaries towed their boats loaded with 1,250 pounds, or even more, along the bank. Four or five men were on the towline with one man in the boat to keep it off the shore. At times the steep gravel bluffs made it necessary to row across the stream, when the swift current would carry the boat downstream, sometimes a half mile below the starting place.

The long-expected pests, the mosquitoes, were out in full force during the stay at this camp, and the men were compelled to wear veils day and night, with gloves to protect the hands. The ferocity of these mosquitoes I regard as something remarkable. The species found here is not the large, singing sort seen in the States, but a small, silent, business-like insect, sharp of bill, who touches the tender spot in a surprisingly short time after alighting. After making their appearance they never left the expedition for a day. The weather was so warm that the men stripped to their undershirts, the thermometer standing between 85 and 88 in the shade for a week.

June 13 the expedition started down the Copper, after having heard of many hair-raising tales of the dangers ahead.

Of four parties of prospectors who had gone down, three had been wrecked and returned a few days later for new boats and more supplies. It was reported that the water ran with such force as to sweep a boat onto a sand bar, turning it end over end. The river was close to high-water mark, with the current about 8 miles an hour. The expedition kept to the deepest channel, to avoid sand bars and make time. We stopped at "Stickwans" (Stephan's) village to interview the Siwashes, who were on the bank awaiting the coming of the salmon, which were hourly expected. The first three salmon caught were boiled in a pot over a camp fire. The Indians invited the members of the party to partake, and, while we wanted fresh salmon, we contented ourselves with taking a taste from the bone spoons to show our hospitality, as the natives were in such evident need of food. The Indians wanted medicine, which could not be furnished, the small stock having been lost on the Klutena, and as they asked for tobacco, all that could be spared of that article was given them. Stephan was on the other side of the river and we were requested to go over and visit him, but declined on account of the swiftness of the current. The natives were glad to see the "Wastonman" (as the whites were designated), and gave the members of the party each a cordial hand-shake. The Indians curiously examined the boat, and in their broken English and Chinook expressed astonishment as to its size. Stephan's tribe was very highly spoken of by whites who had reached the river. They were reported very honest. Goods lost in the river were fished out, dried, and word sent to Copper Center as to where they were, if too heavy for the Indians to pack to that camp. Frequently visiting the camps, yet they were never known to take the smallest article without the owner's permission.

Resuming the voyage, the expedition passed groups of Indians waiting for salmon, who always hailed us, inviting us to stop. Some rough and rapid water was encountered, but, with two good men at the oars and steering with a sweep, the party got along nicely. At places the river was a mile in width, at others it would narrow down to a few hundred feet. Two boats belonging to prospectors were sighted at the mouth of tributaries. Another white man shouted to us and warned us of the rapids a mile farther below, down which we were advised to line our boat. The boat was landed above them,

when it was found we could not walk along that bank, and we were forced to shoot them. These were the worst so far encountered on the Copper. Camp was made early in the evening at a salmon-catching station, where five Indians were found, who had had good success in fishing. Purchasing three fresh salmon, the expedition had its first meal of fresh fish. The Indians have a better knowledge of money than is usually supposed. Two quarters were given in payment for the fish, one a Canadian coin. This was carefully compared with the American quarter, and the Indian handed it back, asking for a good one in its place.

The Chettyna was reached at noon of June 14. Being unusually high, it carried a volume of water nearly, if not quite, equaling that of the Copper. It carried more sediment than the Copper, and was unfit for use. Camp was made on the south side of the Chettyna, only to be moved farther down, where the wind had more effect upon the mosquitoes. June 16 the expedition paid a formal visit to Chief Nicolai at his summer house at Taral, 2 miles below. It was my intention at this time to leave the boat and go up over Nicolai's trail to the summit back of Taral, thence to the head waters of the White River, prospecting for a feasible route to the Yukon country. Near Taral were two men in charge of caches of prospectors who had come up the Copper and gone on up the Chettyna with light boats during low water. These men stated that parties leaving later were unable to make any progress, owing to high water, and had been obliged to camp 10 miles up the river. With the heavy boat I had it was folly to attempt the voyage upstream, and I hoped by getting a guide from Nicolai to make the trip over the trail with enough provisions to last until the coast was reached, or until the pack train reached the river with supplies.

At Taral Nicolai was hailed by the squaws when they saw the white men coming, but, fearing to compromise his dignity, he waited for us to make the advance. He did not comprehend my explanations until a copy of Lieutenant Allen's report was produced containing a picture of Nicolai and his wives, taken thirteen years before. I explained that Lieutenant Allen had written the book and made the maps. Nicolai warmed up immediately, and gazed for a long time at the first picture of himself he had ever seen. He was immensely pleased, and gave vent to his surprise and pleasure with long-drawn-out sighs. I again explained that this expedition was

sent by the same chief that had sent Lieutenant Allen, and who ruled over as many people as there were trees on the mountain opposite; that they also came to see the country and learn how the "Stick Siwash" fared. Then Nicolai told how he liked all "wastonmen," how he had fed Lieutenant Allen and his party, who had "halo muck-a-muck" (no food) when they reached his winter house on the Chettystone. He also said the prospectors who had gone up were good "wastonmen," who "halo sauniced," meaning they neither fought with nor stole from the Indians. He invited us to his house, where we ate salmon off china dishes, drank tea from cups and saucers, and used knives and forks that would have passed muster in civilization. Nicolai then went over the details of Allen's trip with evident satisfaction. He related with much enjoyment how Lieutenant Allen had threatened to use force to compel him to accompany the expedition before he was ready, and how he had stood firm, throwing open his coat that they might shoot him the easier.

When questioned about the trail, Nicolai stated it would take fifteen days with a light pack, or twenty with a heavier one, to reach the head waters of the Chettyna. He firmly declined to furnish a guide, either for "chickamun" (money) or "muck-a-muck" (food), explaining that while the salmon were running the Siwash must stay at the river and fish, or starve when winter came. A month later he would go. The party returned to camp, accompanied by Nicolai, who was banqueted on beans, bacon, tea, and sugar, with a bannock baked in a frying pan. Not having provisions to last the expedition for a trip up the White River Pass, I concluded to remain at Taral for a time, awaiting word from Captain Abercrombie. The time was spent in prospecting the surrounding country. At this point the mountains come down on both sides to the water of the Copper River. The formation is slate. A few colors of gold were found to the pan at nearly all points along the river, and small pieces of pure copper were frequently found in panning for gold.

Between Taral and the Chettyna the Oostina Creek (as it is called by Indians) pours a torrent of water into the Copper. Efforts to ascend the banks of this stream to get to the summit in search for a pass to the coast met with poor success, owing to the precipitous banks of solid rock at places entirely bare of trees, leaving nothing for the climber to cling to.

Taking back to a point where we could get onto the mountain, we followed the ridge up to where the stream forked, thinking we might cross above the forks. Here the stream was found to have the same steep banks as below, the water rushing over a smooth slate bottom and leaping down the benches 10 to 20 feet at a jump. At one place the fall was so great as to make the ground tremble, and the escaping spray looked like steam. The first impression gathered from the bluff, 200 feet above, was that we had come upon some sort of a volcano or warm stream rushing up from the earth. The attempt to secure a photograph was futile, owing to the inability to descend the steep banks.

Along this stream we followed a well-defined game trail, winding close to the bluffs. I think no gold will be found on this creek, as the bed is narrow and the current swift enough to sweep everything before it. Taral Creek, as I have named this stream, empties into the Copper at Taral, having its rise in the range east of the Copper. In company with three prospectors, I went up to its source, crossing the divide on the snow, which, notwithstanding the continued warm weather, was still 5 to 10 feet deep. Farther back to the east could be seen a snow-capped range. To the north was seen Mount Wrangell, from which smoke was issuing. Striking in at the head of another stream, it was followed down to the Chettyna at a point some 15 miles above the mouth. On this trip a good view of the rock formation was had in the gorges with perpendicular walls. Copper indications were plentiful, the copper stain (malachite) showing up in the bluff walls without any apparent connection with lodes and having none of the characteristics of a vein.

Several veins of quartz were encountered carrying iron pyrites, as were two or three apparently low-grade veins of copper, some specimens of which were brought back to camp. While the white quartz veins were carefully examined for free gold, none was detected. The summit of this range, in fact at every point struck in the canyon, the surface was covered with a deep moss, which made walking very tiresome. Every step resembled that of walking on a feather bed. On the night of June 27 water froze one-eighth of an inch thick; nevertheless, there were periods about this date when we were greatly pestered with mosquitoes. At this point in the itinerary word reached the expedition that Spain

had declared war against the United States. No word having been received from Captain Abercrombie, I decided to order C. K. Kuhlman, the only soldier with the party, to take some provisions and make his way back to camp and report to whoever might be in charge. If no instructions were found at Valdez, he was to proceed to the nearest military post. Curran and Harrington, of the expedition, decided to attempt to make their way over to the White River, thence to the Klondike, buying enough provisions from prospectors going out to last them three months. Goodman decided to remain with me and go down the Copper River.

Woods Canyon lies 2 miles below the camp of the expedition at Taral. A strong wind blows up this gorge almost constantly. It comes with such force that it is very dangerous to go through it. No white man not acquainted with currents, it is believed, could take a boat through it during high water. The natives do not go through it except in very low water. It was impossible for me to get any idea of what was before me on account of the height of the walls above the water and the winding course of the river. Apparently it did not seem to me more dangerous than other waters that I had passed. Some years previous a canoe had upset and the whole crew, six or seven in number, were drowned. If a boat did upset, a man's only chance of escape was to swim the length of the canyon, 2 miles or more, as there was no possibility of getting ashore along the bluffs. This was no easy task, when it is considered that nearly all the tributaries to the Copper have their rise from glaciers. Finally some prospectors persuaded an Indian to steer a boat through at the first favorable time when there was a lull in the wind. This came one night, and all hands hustled so as to keep in sight of the Siwash, who before starting offered a prayer to the water god, bade good-bye to his wife and the whole tribe, tied a rope about his waist, making one end of it fast to the boat, and, with his copper-colored face literally white, started on the perilous voyage. Fifteen minutes later he landed at the mouth of the canyon, after having passed over as good a piece of water as any that had been met with on any of the rivers. It is impossible to sail, row, or tow a boat up the canyon during high water. It is safe to come down through it at any time when the wind does not blow too hard.

As much as has been said about the native's ability to handle a boat in the swift waters of the section named, I failed to find him equal to the average white man. The rivers are sacred things to the natives, so much so that they will not, and do not even like to see white men, throw a stone into the stream, for fear of making the water god angry. An ax or hammer is never used to drive a stake in the river when platforms are being built for fishing stations. A stone from the bank is considered the proper thing for this purpose.

In this expedition down to Taral were five men, three of whom had been wrecked on the Chettystone, losing their entire outfit and barely escaping with their lives. One wore moccasins made of canvas, very much patched; another wore a pair of shoes whittled with a pocketknife out of cottonwood, while another had for a headpiece a hat made of cloth from a pair of cast-off trousers. June 30 camp was made at the mouth of the Bremner River, up which stream sufficient encouragement had been found in panning for gold to induce some forty or fifty men to spend the summer there. Some sluicing had been done, but no good strikes were reported. As the distance from Taral to Bremner River is about 50 miles, and the country is quite rough on both sides of the Copper, I saw little chance of getting a pack train through to Taral on either side. From Taral to Bairds Canyon the river forms a sort of lake, some 20 miles long by 5 miles wide. Its local name is Tetchana Bay.

Several small glaciers were sighted as the expedition went along. At the upper end of Bairds Canyon is a good-sized terminal moraine, back of which I supposed was a "dying" glacier. Bairds Canyon was found to be a very smooth piece of water, the river narrowing down from the wide bay to a few hundred feet in width. The head of Abercrombie Canyon was reached at 3 p. m. July 1. One side of this canyon was formed by a wall of immense bowlders, the terminal moraine of the Miles Glacier. The bed of the river is filled with these bowlders, over which the waters of the Copper, confined to a narrow channel between the glacier walls and the bluffs of solid rock, go tearing through at a high rate of speed. I hoped to overcome this obstacle either by running the rapids or by lining the boat down the shore. On viewing them, however, I decided that we would be fortunate if we got through with an empty boat. Finally I portaged

the load over a trail that ran along the face of the bluff on the right bank. In one place I passed over a snowslide that sharply pitched toward the river. A misstep meant almost certain death. At another point the boat went under a slide 20 feet in thickness, from which the water dripped as if from a wet roof in a tunnel. After portaging such goods as were indispensable, the remainder was abandoned. The boat was lined down, receiving such rough usage as to spring the timbers and cause it to leak badly. The next danger was from the swell caused by the ice breaking off from the Childs Glacier, which sometimes created such waves as to land a loaded boat 150 feet high and dry on the shore. The current swings directly toward the glacier on making the turn, and it required all the strength at hand to keep from being carried with it. The river was filled with floating ice, some pieces being almost the size of a freight car. That night camp was made at Alaganik. A row of 30 miles across the delta landed us at Eyak River. Eyak was reached at 2 a. m. July 6. Portage at this point was made over a canning company's tramway of half a mile to Prince William Sound, where we were picked up in the afternoon. That night the party was towed to Valdez Landing, which was reached at 5 a. m. July 7, accompanied by the boat which had made the trip from 12 miles beyond the Bates Glacier.

In my narrative of events there seem to be but two known routes from this section—one by Copper River, the other over Valdez Pass. The latter I consider in every way the more practicable for man, beast, or railroad. I met and talked with many miners who traveled up the river, and they found it a decidedly difficult road to travel. It was all the way up grade, with a most disagreeable climate, owing to the continued high winds blowing downstream.

REPORT OF QUARTERMASTER AGENT CHARLES BROWN.

RELIEF FEATURES OF THE EXPEDITION.

I took charge of issuing rations to destitute prospectors August 5, 1898. I fed during the months of August, September, and October, 306 men. Of this number 121 were carried south gratis by the steamers of the Pacific Steam Whaling Company. All were practically without means. One hundred and eighty-five men paid for second-class passage, ranging from $5 to $25, to either Seattle or Juneau. Many left for the latter place, en route to other points in Alaska seeking work, with the intention of returning to Valdez upon acquiring new outfits. Improvements were made through the labor of those provided for in camp as follows:

Built smokehouse, 16 by 16 in the clear, 65 logs, which was a necessity, owing to the deterioration of bacon through climatic changes; washed and resmoked bacon; cut 10 tons of hay; built stable, 16 by 125 feet, consisting of 205 logs; cleared brush and timber from immediate neighborhood of camp; made footbridge over glacier stream running through camp; have now in collection a supply of fuel; built eagle house, 13 by 13 feet, 60 logs; hauled gravel for bottom of stables, roads, and footpaths; assisted in hauling lumber for the erection of relief station on glacier established by the Christian Endeavor Society of Valdez. Assistance was extended by sending saddle animals to the glacier to assist those coming over sick or lame on nine different occasions. The majority of men arrived here from their trip over the glacier in an exhausted physical condition, which required several days' time to recuperate.

One of the most marked circumstances of interest is the satisfaction prevailing in the minds of the prospectors. With the further advance of the season, and with the withdrawal of the discontented and "green" prospectors, a general higher hope exists as to the future. Prospects have been struck that indicate a rich mineral country, mining districts have been formed, and everything points to a general development throughout the country. The few that are now leaving leave

behind their caches and start for the States with the intention of returning with pack animals. A number of men have returned to Valdez to build cabins for the winter, representing parties or companies left in the interior, with the intention of having headquarters here as a base for their supplies. Those remaining in the interior represent altogether the experienced miners and prospectors, those leaving the country being inexperienced and coming unprepared to meet the hardships incident to the work. A number of narrow escapes have occurred on the glacier trail, several falling in crevasses and were only rescued at great risk. One case in particular was that of John R. Herman, who on September 12 was one of a party of four who, while following in the rear, was suddenly missed by his friends. An immediate search resulted in finding him back some distance, having fallen in a crevasse to a depth of 40 feet, where he became wedged. On discovery, Mr. Fred. Kimball, one of the party, traveled 12 miles for rope and assistance, and Mr. Herman was rescued after five hours' confinement, with many bruises, but without further serious injuries. The spot where the accident occurred had been safely passed by the remainder of the party, the crust of snow over the crevasse sustaining the weight of others.

The army ration has proved insufficient for the necessities of the men here, the climate and air inducing immoderate appetites, which the ration alone could not meet. Fish, however, in the greatest abundance, with huckleberries and salmon berries also in plenty, has materially swelled the ration and given a most desirable change. The scales of the commissary have been used very generally in showing the added weight of many prospectors, and it is a significant fact that practically none have lost flesh. The health of those reaching this camp has been throughout excellent. Fifty-four men have been treated by me for trivial ailments, such as colds, sore feet, lame backs, etc., generally induced through unusual exposure and hardships, wading in cold water. All yielded to care and hot water, with the exception of one case, where the patient went to Seattle for treatment. Five were treated by the doctor for chronic ailments.

The opinion of old prospectors, who are practical miners, is high in regard to the mining prospects of the country, and it is this class who are now remaining in the interior and are doing active prospecting. The percentage of experienced

miners to the green men was about 15 per cent of all those coming to this point. This estimate is based on information and inquiry from many miners here.

The percentage of those "grub-staked" was large, consisting of at least 60 per cent of everybody. Many of this class never crossed the glacier or made any attempt at prospecting. The average age of prospectors I would estimate as being about forty years, many men of old age being among the number and making a high average. Volunteers for carrying on the work on the summer trail have been numerous, and all have shown a disposition to make this the popular route into the interior. Through the assistance of these, I have constructed a cabin 16 by 20 feet on the summer trail at what is known as Station 24. The opinion usually exists that this trail can be made into a safe, all-the-year route, with no glacier to cross. A natural prejudice prevails against using any trail where it would be necessary to cross a glacier. On the Valdez Glacier snowslides are in many places a source of danger, while the high winds so often found there render the trail impassable. A case occurred on November 7 where a guide, John Bell, was lifted clear of the ice and carried several yards by the force of the winds.

On October 28 one mule and one gray horse, branded U. S., were shot. On October 30, while in course of building Station No. 24, one black horse loaded with bedding reared up on trail, and falling, rolled down the side of the mountain, breaking its back, and it became necessary for Packer S. S. Lynch, in charge, to kill him.

On October 30 I received from steamer *Rival* 60,000 pounds of hay, and from Captain Glenn, Twenty-fifth Infantry, I received 11 crates of bacon and 33 boxes of hard-tack. The steamer *Rival*, returning southward, took one man gratis.

There was taken into the interior during the months as stated below, viz, August, 1,260; September, 1,001; October, 1,977 letters.

On November 7 the following men reached Valdez from the interior, viz: W. C. Bruce, of Tacoma, Wash.; Heber Smith, New York City; Oscar H. Peterson, Chicago; V. T. Malmgren, Chicago, and B. G. Levcross, St. Paul, Minn. They all return south with the intention of starting again for Valdez about February 1, 1899, with pack animals and outfits.

They report that coarse gold and nuggets have been taken

on surface prospecting on the Teikhell River. A number of men are working on Mauker and Quartz creeks, both of which are tributaries of the Tonsena. There are also a number of men working on Earnestine Fall and Boulder creeks, tributaries of the Teikhell. Shelton Creek, a tributary of the Klutena, is also being worked, with very promising results. There are other parts of the Copper River Basin that the men are very reticent about as yet, and apparently know more than they desire to say at the present time.

There has been a great sense here of appreciation of the establishment of a Government relief station at this point, not only by those who have been assisted, but by the townspeople as well. The opinion here is that the station has relieved many and obviated possible violence by some without means, who actually required food and shelter. Men have spoken in high praise of the thoughtfulness of the War Department in anticipating the condition liable to exist here, and in making provision for the needy. There will be required here 1,000 feet of lumber for the construction of doors, feed boxes, and mangers.

Several circumstances occurred late in the season that I will mention as showing the perilous character of the trail into the interior by way of the glacier. On November 14 the Grogg brothers, J. B. Ferguson, John Polinsky, and John Egram, with a party of nine altogether, left Twelve-Mile camp for Valdez. Two of these, a father and son, returned, and one, Mike Smith, gave out within a mile of the summit and froze to death, those accompanying him being entirely helpless and unable to render assistance. A relief party started from Valdez a day after their arrival here, but could find no trace of him and were obliged to abandon their trip, owing to a perfect hurricane blowing on the glacier. On November 15 a party of several, among whom were Walker brothers, Mr. Barrey, and Harry Fain, left Twelve-Mile camp, reaching the summit on the same day, where owing to the terrific storm they found it necessary to dig a hole in the snow with their snowshoes, where they remained four days and four nights, subsisting during this time on four quarts of beef stock and ten beef capsules. Henry Krohn, who was also of this party, reached Valdez in a bad condition, and after a week's sickness he died there. Every attention possible was given him, but blood-poisoning followed, and the efforts of

his attending physician and others were without avail. His death was directly attributable to exposure on the glacier and having his feet frozen, followed by a long interval without medical treatment.

A party of four men, consisting of A. J. Wadum, Glasgow, Mont.; J. R. Marshall, Mexico, Mo.; John Eckland, Haywood, Wis., and Nels. Hegland, Appleton, Wis., arrived here over the glacier, being six days en route. They report the weather of the interior as cold, the thermometer running down to 48° below zero, with about 3 feet of snow on the ground. They started well equipped to cross the glacier, carrying an oil stove, shovels, provisions, and other utensils necessary, and only made the relief station just as their provisions were exhausted.

There has been much trouble in supplying Station 24 on the summer trail with provisions, and not until January 15, 1899, was I able to get this under way. Heretofore the soft snow of great depth has made packing almost impossible. But there are now on the way the following provisions, which will reach there about January 25, 1899, viz: 1,000 pounds bacon, 1,800 pounds flour, 4 cases granulated potatoes, 150 boxes coffee, 10 pounds hard-tack, 5 pounds pepper, 150 pounds salt, 200 pounds sugar, 400 pounds beans, 25 sacks oats, 1,200 pounds hay, 10 axes, 6 shovels, 4 picks, and 40 pounds rice.

From the general feeling of those who have come over that route it is thought that the glacier trail will never again be generally used. With Station 24 built and equipped, the new route will entirely supersede it. It is, furthermore, the short-cut route to the most promising placer fields thus far located.

METEOROLOGICAL OBSERVATIONS TAKEN AT PORT VALDEZ, ALASKA, FROM APRIL 19, 1898.

[Appendix to Captain Abercrombie's Report.]

Date.		Weather.	Remarks.
April	19	Snow and rain	
	20	do	
	21	Clear	
	22	do	
	23	do	
	24	Snow	High wind.
	25	do	
	26	Clear	
	27	Snow	
	28	do	Heavily.
	29	do	
	30	do	Snowslides.
May	1	Snow	Snowslides.
	2	Snow and rain	
	3	Clear	
	4	do	
	5	do	
	6	do	
	7	do	Getting warm.
	8	do	
	9	do	
	10	do	Snow soft and melting.
	11	do	
	12	do	Snow going fast.
	13	do	
	14	Rain	
	15	do	
	16	do	
	17	Clear a. m., rain p. m.	
	18	Clear	
	19	do	Cold.
	20	do	Warmer; no crust.
	21	do	
	22	do	
	23	do	
	24	do	
	25	do	
	26	do	
	27	do	
	28	Cloudy and rain	
	29	Rain	
	30	Clear	Very warm.
	31	do	Do.
June	1	Rain	
	2	do	
	3	do	
	4	do	
	5	do	

Meteorological observations taken at Port Valdez, Alaska—Continued.

Date.		Weather.	Remarks.
June	6	Clear	
	7	Rain	Very warm.
	8	Cloudy	
	9	Clear	
	10	do	Snow going fast.
	11	do	Very warm.
	12	do	Do.
	13	do	Do.
	14	do	
	15	do	
	16	Cloudy	
	17	do	
	18	Clear	
	19	do	
	20	Cloudy	
	21	do	
	22	do	
	23	Clear	
	24	Cloudy	
	25	Rain	
	26	Clear	Very hot.
	27	do	Everything flooded.
	28	Cloudy	
	29	Rain	
	30	Cloudy and rain	
July	1	Rain	
	2	do	
	3	Clear	Warm.
	4	do	Do.
	5	Cloudy	
	6	do	
	7	Rain	Hot.
	8	Clear	
	9	Cloudy	
	10	Rain	
	11	Cloudy	
	12	Clear	
	13	do	
	14	do	
	15	do	
	16	do	
	17	Rain and fog	
	18	do	
	19	Clear	
	20	Cloudy	
	21	Rain and fog	
	22	do	
	23	do	
	24	do	
	25	do	
	26	Cloudy; rain	
	27	Rain and fog	
	28	Rain	Water standing in pools all over ground.
	29	Rain (hard)	
	30	Rain and fog	
	31	do	

Meteorological observations taken at Port Valdez, Alaska—Continued.

Date.		Weather.	Remarks.
Aug.	1	Rain day and night	
	2	do	
	3	do	
	4	do	
	5	do	
	6	do	
	7	do	
	8	Pleasant half day	
	9	do	
	10	Good weather	
	11	do	
	12	Rain half day	
	13	Pleasant	
	14	Rain	
	15	Pleasant	
	16	Rain day and night	
	17	Rain half day	
	18	Rain	
	19	Pleasant	
	20	Rain half day	
	21	do	Hardest of season.
	22	do	
	23	Rain and fog	Heavy earthquake 10 p. m.
	24	do	
	25	do	
	26	Pleasant	
	27	do	
	28	do	
	29	Rain	
	30	Pleasant	
	31	Rain	Average temperature for August, 55°.
Sept.	1	Pleasant	
	2	Rain day and night	
	3	do	
	4	Pleasant	U. S. S. Wheeling in; visit from Captain Sebre, doctor, lieutenant, paymaster, and the governor.
	5	do	
	6	do	
	7	Rain	
	8	Pleasant	
	9	do	
	10	do	
	11	do	
	12	do	
	13	Rain	
	14	do	First snow on mountains, coming halfway down them.
	15	Pleasant	
	16	Rain	
	17	Pleasant	Snow gone; trees turning yellow.
	18	do	
	19	Heavy frost	Snow on mountain.
	20	Pleasant; cold	Joseph T. Scully died from exposure on the glacier.

Meteorological observations taken at Port Valdez, Alaska—Continued.

Date.		Weather.	Remarks.
Sept.	21	Heavy wind	
	22	Rain	
	23	Pleasant	
	24	do	
	25	do	
	26	Rain	
	27	Pleasant	
	28	do	
	29	do	
	30	do	Average temperature for September, 48°.
Oct.	1	Strong wind all day	
	2	do	
	3	Pleasant	
	4	do	
	5	do	
	6	do	
	7	Rain	
	8	Pleasant	
	9	do	
	10	Heavy frost	
	11	Strong wind	
	12	Pleasant	
	13	Heavy wind day and night.	
	14	do	
	15	Pleasant	
	16	Windy; light rain	
	17	Rain; half day snow	First snowfall.
	18	Pleasant	
	19	Rain, light	
	20	Pleasant	
	21	do	
	22	do	
	23	do	
	24	Heavy wind	
	25	do	
	26	Pleasant	
	27	Heavy wind and cold	
	28	Cold wind	28° above.
	29	Pleasant	
	30	do	
	31		Average temperature for October 40°.
Nov.	1	Pleasant	
	2	do	
	3	do	20° above.
	4	do	15° above.
	5	do	
	6	do	
	7	do	
	8	do	
	9	do	
	10	Snowy	2 inches snow.
	11	do	5 inches snow.
	12	Rain all day	
	13	Snow	
	14	do	

Meteorological observations taken at Port Valdez, Alaska—Continued.

Date.		Weather.	Remarks.
Nov.	15	Snow	
	16	Heavy wind day and night.	
	17	do	
	18	do	
	19	do	
	20	Cold and pleasant	
	21	Pleasant	
	22	do	
	23	do	
	24	Snow	
	25	Rain	
	26	Snow	
	27	Cold wind	
	28	Pleasant	
	29	Light snow	2 inches.
	30	Pleasant	Average temperature for November, 24°.
Dec.	1	Pleasant	
	2	do	
	3	do	
	4	Snow, light	
	5	Snow, heavy	
	6	do	
	7	Rain	
	8	Light fall of snow	
	9	Pleasant	
	10	do	
	11	do	
	12	Cloudy and mild	
	13	do	
	14	Rain	
	15	Foggy and mild	
	16	Light snows	
	17	do	
	18	do	
	19	Pleasant	
	20	Light snows	
	21	Heavy snows	
	22	do	
	23	Pleasant	
	24	Heavy snows	
	25	do	
	26	Pleasant	
	27	Clear; high winds	
	28	do	
	29	do	
	30	do	
	31	Pleasant	Average temperature for December, 25°.
Jan.	1	Pleasant	
	2	do	
	3	do	
	4	do	
	5	do	
	6	Snows	
	7	Pleasant	
	8	Clear; high winds	

Meteorological observations taken at Port Valdez, Alaska—Continued.

Date.	Weather.	Remarks.
Jan. 9	High winds	
10	do	A high wind, cold, and carrying immense drifts of snow.
11	do	
12	do	
13	do	
14	Pleasant	
15	do	
16	do	
17	Cloudy and light snows	
18	Snowy	

FURTHER EXPLORATIONS IN ALASKA.

Explorations in Alaska are now being continued under the following orders:

GENERAL ORDERS, No. 51.

HEADQUARTERS OF THE ARMY.
ADJUTANT GENERAL'S OFFICE,
Washington, March 20, 1899.

The following orders have been received from the War Department:

WAR DEPARTMENT, *Washington, March 17, 1899.*

I.—A military expedition for exploring purposes in Alaska will be organized as follows, and known as the Copper River Exploring Expedition, and will be announced in orders:

1. Captain *W. R. Abercrombie*, 2d U. S. Infantry, commanding; 2d Lieutenant *W. C. Babcock*, 8th U. S. Cavalry; one acting assistant surgeon; one hospital steward; one commissary sergeant; two noncommissioned officers and eight privates of infantry, of whom two shall be cooks, fully equipped and supplied to November 30, 1899, will proceed to Valdez, on Prince William Sound, Alaska, on or about the 15th proximo, and there establish a camp and depot. From Valdez the expedition will open up a military road to Copper Center, and from the last-named point by the most direct and practicable route to Eagle City.

2. The route above outlined from the coast to Eagle City will be carefully surveyed, triangulated, noting elevations, depressions, and other features, and should be definitely located and properly marked on either side as far as practicable, in order that it may be known and used as a route of travel by the public.

3. The commanding officer will select suitable locations at Valdez, Copper Center, the crossing of the Upper Copper, the crossing of the Tanana, the head of Forty-Mile Creek, and at such other points as in his judgment he may deem proper for military reservations, and will survey, lay out by metes and bounds, and declare such reservations, reporting his action hereunder to the Department for the approval of the Secretary of War.

4. This expedition will cover as much territory as possible, and will collect and incorporate in the reports all information that may be valuable to the development of the country explored regarding topographical features, available routes of travel, feasible routes for railroad construction, adaptability for agriculture and stock raising, mineral resources, timber, fuel, food products, and the stock best suited for food and transportation purposes; the number, location, and condition of the natives of the territory explored. Maps and photographs will accompany all reports.

5. The commanding officer of the expedition is authorized to employ the necessary Indians, natives of Alaska, for duty with the expedition as guides, for such periods of time as may be necessary.

The Quartermaster's Department will furnish the necessary transportation.

II.—A military expedition for exploring purposes in Alaska will be organized as follows, and known as Cooks Inlet Exploring Expedition, and will be announced in orders:

1. Captain *Edwin F. Glenn*, 25th Infantry, commanding; 1st Lieutenant *H. G. Learnard*, 14th Infantry; 1st Lieutenant *J. C. Castner*, 4th Infantry; 1st Lieutenant *Ralph R. Van Deman*, 21st Infantry; one acting assistant surgeon; one commissary sergeant; Sergeant *William Yanert*, 8th Cavalry, and one sergeant, one corporal, eleven enlisted men, of whom five shall be cooks, and two privates of the Hospital Corps, fully equipped and supplied to November 30, 1899, will proceed to Tyoonok, Cooks Inlet, Alaska, on or about the 15th proximo, and there establish a camp and depot. The expedition will disembark en route a small detachment at Portage Bay, Prince William Sound, Alaska, to explore, survey, establish, and mark the trail from that point to the camp now located at the head of Knik Arm. From the permanent camp at Tyoonok, Alaska, detachments will be sent to explore the country to the northward, via the Matanuska, Sushitna, Yedno, and Kuskokwim rivers, for the most direct and practicable route from tide water to the crossings of the Tanana River, and from these crossings northward to the military posts established on the Yukon River at Rampart and Circle City. One detachment will explore the west bank of Cooks Inlet from open tide water to the head of navigation of the Sushitna River for the most practicable overland trail.

The district of exploration for this expedition will be via the routes indicated and bounded on the north and west by the Yukon and Koyukuk rivers and on the east by the Copper River.

2. This expedition will cover as much territory as possible and will collect and incorporate in the reports all information that may be valuable to the development of the country explored regarding topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military reservations, adaptability for agriculture and stock raising, mineral resources, timber, fuel, food products, and the stock best suited for food and transportation purposes, the number, location, and condition of the natives of the territory explored. Maps and photographs will accompany all reports.

3. The routes traversed by this expedition should be definitely located and properly marked, in order that they may be known and used as routes of travel by the public.

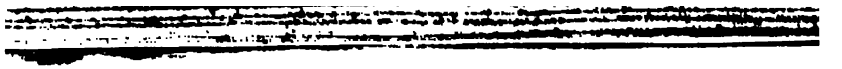
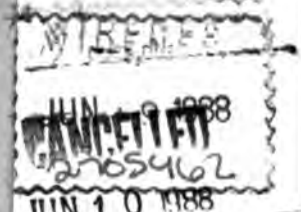
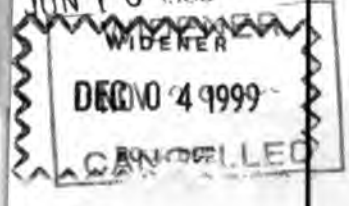
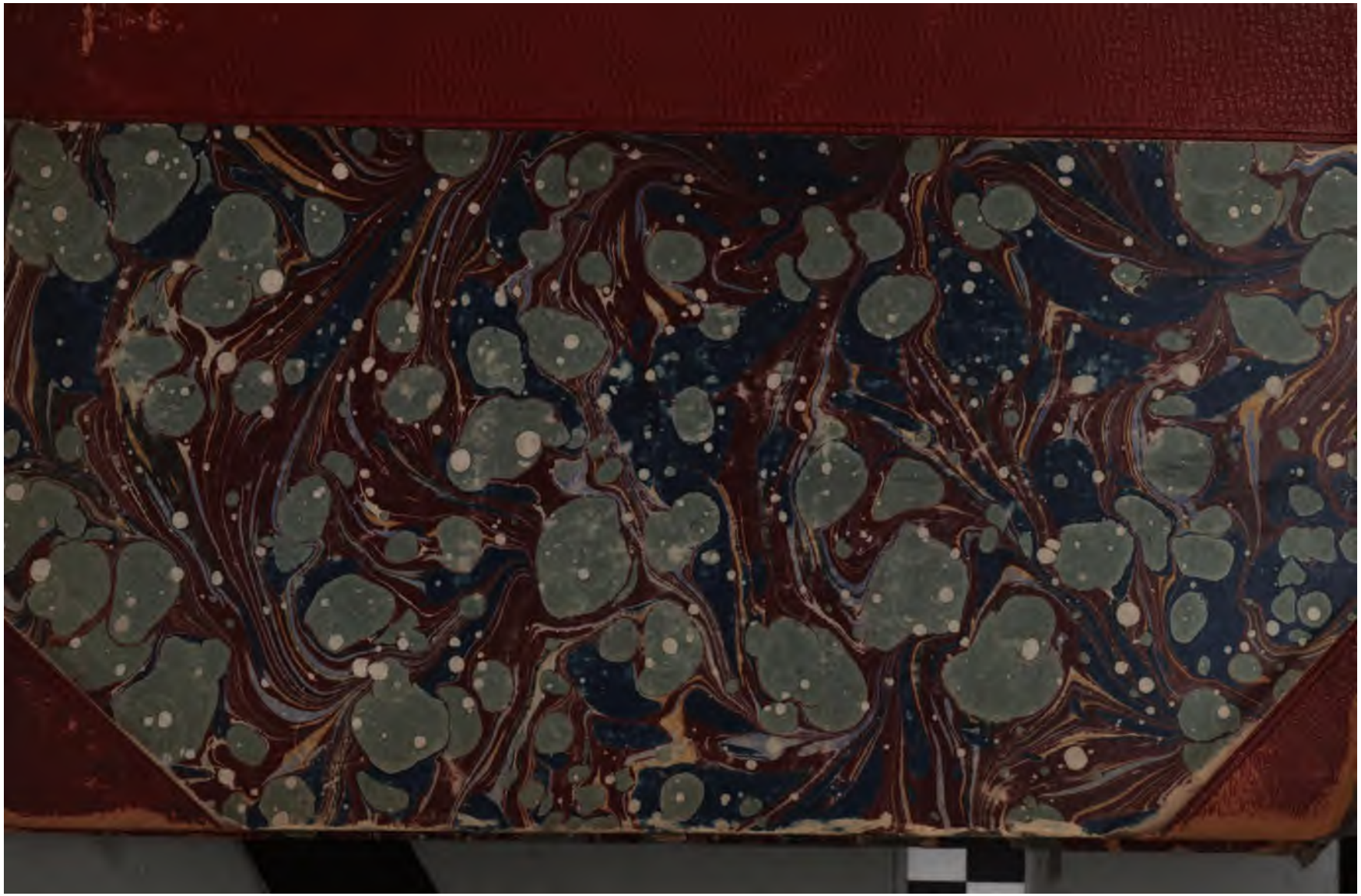
4. The commanding officer of the expedition is authorized to employ the necessary Indians, natives of Alaska, for duty with the expedition as guides, for such periods of time as may be necessary.

The Quartermaster's Department will furnish the necessary transportation.

G. D. MEIKLEJOHN,
Acting Secretary of War.

BY COMMAND OF MAJOR GENERAL MILES:

H. C. CORBIN,
Adjutant General.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